THE BRASS WORLD

AND

PLATERS' GUIDE

A JOURNAL
DEVOTED TO THE
ART OF REFINING,
ALLOYING, CASTING,
ROLLING, FOUNDING,
AND ELECTROPLATING
OF ALL THE
NON-FERROUS
METALS

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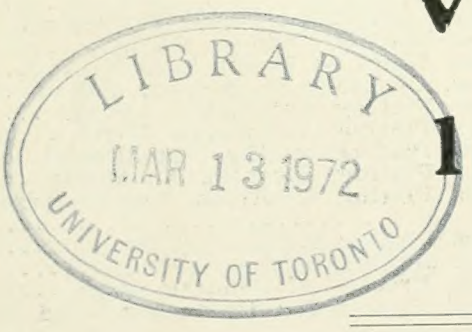

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Note on Art Metal Work Made from Brass Castings.

Comments are frequently heard about the scarcity of small art metal goods made of bronze or brass castings, and it seems to be the general opinion that such work would sell. There is such a quantity of cheap metal wares made of soft metals annually thrown on the market that one might naturally believe solid metal goods would find a ready sale. There is no doubt but that they would could such goods be made sufficiently cheap to satisfy the popular demand for a cheap or medium priced article; but up to the present time it has not been possible to do it, and unless some radical discovery is made in the method of making brass castings, the future will not find any change.

The advantage of soft metal castings over brass for art metal wares is that they are delivered from the mold in practically a finished condition and require no chasing. They are smooth and with true designs. Indeed, any polishing or buffing that is put upon them actually injures the design rather than improves it. It is readily understood, therefore, why soft metals can be turned out so cheaply. The casting requires a simple electroplating and lacquering to render it ready for the market.

Brass or bronze castings must be treated differently. The casting, of course, is far more expensive as a permanent mold cannot be used. After the castings have been made, no matter how fine the sand may have been,

there is a certain amount of roughness on the surface which must be removed by chasing before they are ready for the market. To buff off the "high-lights" of the casting will not suffice to give it a good appearance as the background and bottom of crevices cannot be reached. To smooth these up in a satisfactory manner, they must be chased out by hand.

Chasing is an expensive operation and adds to the cost of the work considerably. In French sand molding or similar work, it is usually considered that the chasing costs as much as the molding. One might naturally think that chasing could be omitted and the article buffed off, but this only serves to polish the "high-lights" and leaves the background rough and unsightly. Goods finished in this manner do not appeal to a prospective buyer. Good bronze work, such as imported statues and similar cast goods which are so beautiful, are chased all over which leaves them with their well known attractive appearance.

Use of Dynamos of too High Voltage.

Makers of dynamos for electroplating will wind them for any desired voltage so that when one of too high voltage is found in a plating room it indicates that the makers are not to blame. From the number of instances in which this has been found, it would seem that there is a constant tendency to use a greater voltage than is required or is even desirable.

The voltage used in plating is governed by the kind of metal to be deposited. For silver, 1 volt or less is used and for the other metals a greater quantity is employed, but it is seldom that over 3 or 4 volts are necessary. In one establishment, where silver plating was carried on, a 10 volt dynamo had been installed with the belief that "the extra voltage might sometime be wanted".

One wise individual has rightly said that volts cost money; and so they do as it is the amperes that actually serve in the deposition of the metal; but it is not the actual cost that is so undesirable. There is a constant danger of using too strong a current unless it is carefully cut down by suitable rheostats.

Platers who understand their business could use an electric light current by properly cutting it down, but it would not be considered advisable on account of the fact that although paid for, the extra voltage could not be used. When a 110 volt current is cut down, by means of a rheostat, to 6 volts, the 104 volts are entirely wasted. The same is true in cutting down a 10 volt current to a less quantity.

It will readily be appreciated, therefore, how undesirable a high voltage dynamo is unless actually necessary for barrel work or an electric cleaner. Few platers have rheostats adapted for cutting down the current to the necessary degree, and the result is the use of too strong a current in plating. For the majority of work, even the customary 6 volt dynamo is of higher voltage than is necessary, and there are many establishments in which 3 volt dynamos have been found quite satisfactory and economical. Although a certain additional voltage is necessary to overcome the resistance of the conducting rods and connections, if these are of copper and not of too small size or excessive length, there is usually little drop in voltage on this account. Those who are about to install a dynamo for plating should avoid the use of too high a voltage machine. The output of the machine in amperes may be of any amount that is greater than that necessary for carrying on the work, as at a given voltage only a certain quantity will flow through the plating solutions, no matter how large the output in amperes the dynamo may have.

The Largest Production of Lake Copper.

The close of the year 1909 witnesses the largest output of Lake Copper in the Lake Superior mining district in its history. During the year about 236,335,700 lbs. of ingot copper were produced, while in 1908, 222,674,918 lbs. The largest output ever made was in the banner year of 1905 when 230,437,902 lbs. were made.

Of the 236,335,700 lbs., the largest producer was the Calumet & Hecla mine which made 80,815,500 lbs. The Osceola produced 25,450,000 lbs.; the Quincy, 21,500,000 lbs.; the Champion, 19,330,200 lbs.; the Tamarack, 12,606,000 lbs., and the Baltic, 19,339,200 lbs. The rest of the output was made by fifteen smaller companies with a corresponding production.

Aluminum-Bronze and What Can be Done With It; Its Good and Bad Qualities.

By Erwin S. Sperry.

No copper alloy held out more promise at the time it was produced commercially, and none has proved more disappointing than aluminum-bronze. After much good and bad experience with it, I will frankly say that it is a bronze without a peer, and the early "worshippers" of it did not over-rate it by any means. The lack of success has been caused by the difficulty in casting it, and not from any absence of merit in the metal itself. I say casting it, for the reason that there never have been any difficulties with the working of the metal when it was good. Difficulties encountered in working, such as rolling, drawing, forging, etc., have been wholly caused by the use of cast metal unfitted for the purpose. Given a good casting, and no trouble is experienced in treating it. It is readily rolled or drawn, forges well and rolls hot, is not black or red short, and is susceptible to all of the treatment given the other copper alloys or copper itself.

Aluminum alloys with copper in all proportions and homogenous mixtures are produced. When the aluminum reaches beyond 10 per-cent the bronze begins to become brittle, and a 12 per-cent mixture is so hard that it may be used for hard dies. The mixture generally used for sand casting is the 10 per-cent alloy. It is hard and tough and answers all the requirements of a strong metal.

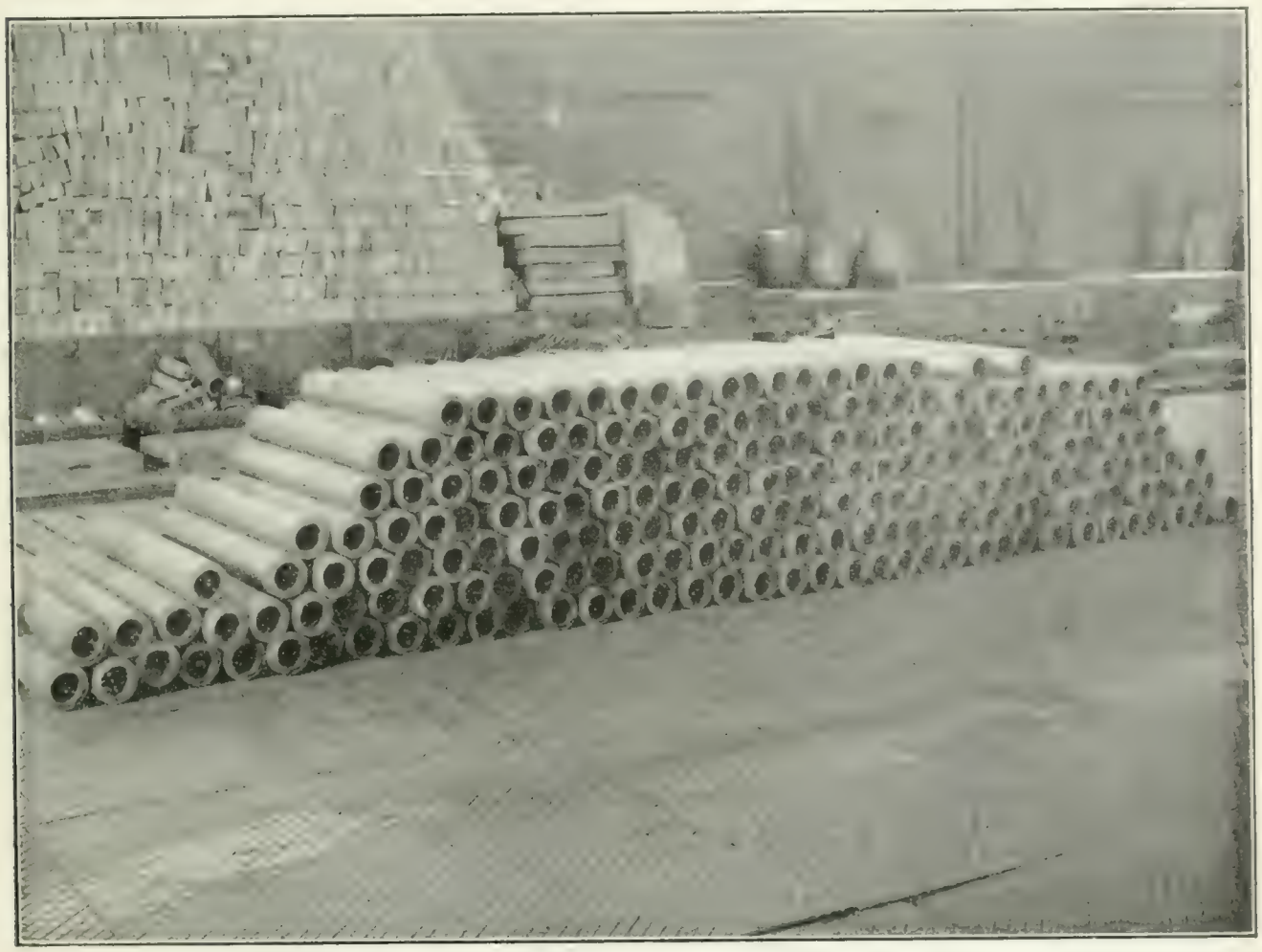


Fig. 1. Tube Shells of 4 per cent. Aluminum-Bronze. Cast in a Combination Sand and Chill Mold. The Shells Were Afterwards Rolled Hot and Drawn Cold into Seamless Tubes.

Difficulty in Casting.

Unlike the tin bronzes, there is no tendency for the aluminum to separate in different alloys and liquation has never been found to interfere. It is safe to say that they are the most homogeneous of any known bronze. Neither do they show the tendency to crystallize like the brasses or other alloys of copper containing zinc. Crystallization has never been found. They are therefore, "safe" alloys for construction purposes. To illustrate this point, I may say that thousands and thousands of small pins of cast aluminum

bronze (10.5% aluminum) have been used by our Government in the Springfield rifle. These pins, called "firing-pins" were used for firing the cartridges, and were employed because steel would not stand. I cite this to indicate how "safe" aluminum bronze is and what it will do under the most severe circumstances. These little pins were cast in green sand, *and then forged hot to a long, thin point.* This forging operation is a severe test in itself. It was rare that imperfect ones were found.

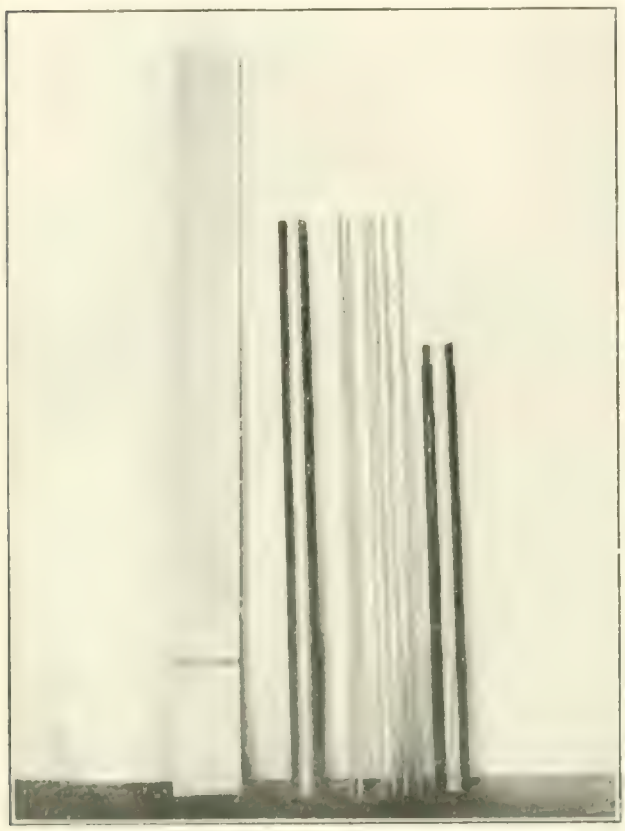


Fig. 2. Aluminum Bronze Sheet, Hot Rolled Rod Wire and Tube. The Sheet and Rod Contained 10 per cent Aluminum. The Wire and Tube 5 per cent.

The greatest obstacle in the way of casting aluminum-bronze is its oxidation when melted. Whenever the surface of the molten metal is exposed to the air, a film of oxide of aluminum forms on it. The more it is exposed, the greater the amount. This explains why such a large amount of dross forms when aluminum-bronze is stirred. When allowed to remain at rest in a crucible, very little forms as the surface of the metal is protected by the film already on it. It also shows why aluminum-bronze should always be poured with as little stirring as possible. Any agent, such as wet sand, which tends to stir the metal up, produces dross and the accompanying dirty castings. The more quietly aluminum-bronze can be poured, the better the castings. This is an axiom not to be forgotten.

It is this always present oxide that has held back the extensive use of aluminum-bronze and caused so many foundrymen to give it up in disgust. Sometimes a good casting could be obtained, and at other times the loss would be heavy. Dirty castings were the cause. The question is one which bothers foundrymen who cast manganese-bronze at the present time, as this material contains aluminum. Dross is the greatest obstacle encountered, and it is one of the difficult problems to solve. With manganese-bronze, however, the case is not as bad for the reason that it contains only about half a per-cent of aluminum.

To cast the aluminum-bronze without the presence of some dross on the surface is a very difficult matter; and theoretically the right method of doing it would be to cast in a vacuum or neutral atmosphere so that no air would come in contact with the molten metal. This, of course, is not commercially possible. The only method by which it can be cast in a commercial manner is to prevent its being

Fig. 3. Chips of 5 per cent. Aluminum Bronze. Shows Toughness of the Metal

agitated while the pouring is taking place, either by stirring, too high a drop from the crucible to the mold, or by wet sand. The more quietly it can be poured, the smaller the quantity of the dross. Dross which forms in melting may be skimmed off, but that which forms while the pouring is taking place enters the casting. The various skim gates, pouring from the bottom etc., are all efficacious as they serve to trap the dross and prevent its entrance into the casting.

One mixture of aluminum-bronze seems to cast about as well as another. There is no addition that can be made to overcome the dross formation, nor will any flux obviate it. It is produced whenever the metal is exposed to the air, and while the surface of the melted metal just before pouring may be quite clean, the least agitation will again expose fresh surface and cause additional oxidation, and in pouring more forms. The secret, if it may be called so, seems to lie in preventing the entrance of the dross into the casting, and not in its formation.

copper and zinc mixtures. One aluminum-bronze mixture works as well as another with the exception that the more aluminum it contains the softer it is at a red heat. The 10 per-cent aluminum-bronze, although much harder than the 5 per-cent mixture, is considerably softer when red hot.

Considerable difficulty was experienced, in the early days of aluminum-bronze, in forging or hot-rolling it. The metal cracked while being worked. This feature is caused by pouring the bronze into the mold at too high a temperature so that slow cooling with a

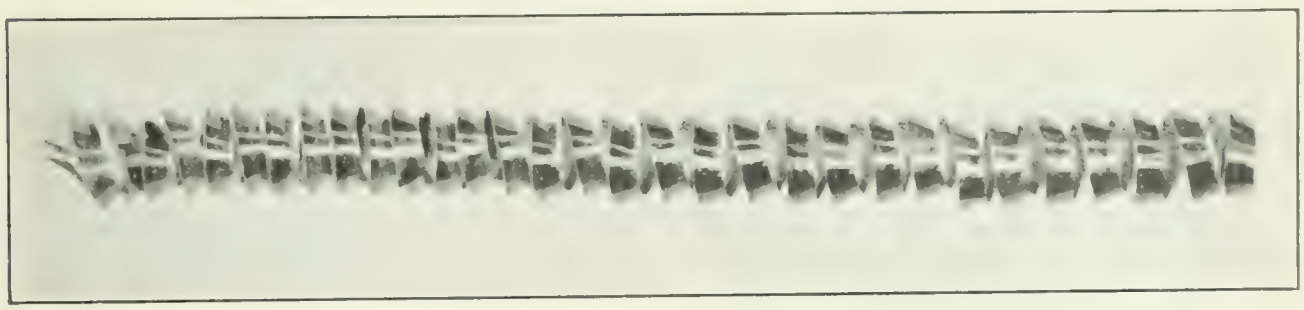


Fig. 4. Long Chip of 4 per cent. Aluminum-Bronze Turned from a Billet.

While the presence of dross is the greatest obstacle encountered in the casting of aluminum-bronze, it may be said that the shrinkage is the next. All strong metals shrink considerably, and in the case of aluminum-bronze the shrinkage is equal to that of steel. When a riser on a casting pipes down to a considerable depth, it shows that contraction is taking place during the cooling. A strong metal results.

Shrinkage is easily taken care of if a molder understands his business. By the use of sufficiently large risers and freedom from sharp corners in the casting with an ample gate, any shrinkage may be readily overcome. It should always be the rule to use risers of sufficient size to take up the shrinkage. Many of the early failures in the casting of aluminum bronze were caused by the use of either no risers at all, or ones too small so that they actually drew from the casting rather than fed it.

Hot Rolling and Forging.

Aluminum-bronze works hot even better than copper as it is softer while at a red heat. At the same time, it is not black-short like the copper and zinc alloys (Muntz-metals). In addition to this all of the aluminum and copper mixtures may be worked hot, something which cannot be done with all of the

coarsely formed structure follows. Dross, too, was partially responsible for the cracking as it prevents the union of the particles of metal.

To indicate that aluminum-bronze is an excellent hot working metal, it may be said that the mortars in the Government fortifications along the Atlantic coast are held down in the

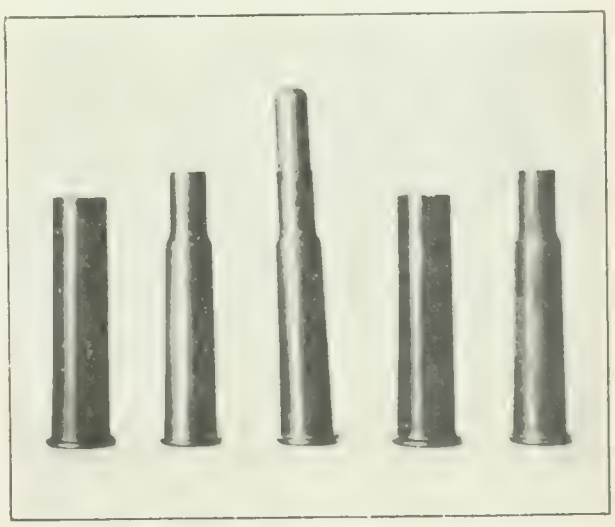


Fig. 5. Cartridge Shells Made of 5 per cent. Aluminum-Bronze.

masonry fortifications with aluminum-bronze bolts. These were selected by the engineers for the reason they had the strength of steel, the non-corrosive properties of copper or brass (or even superior) and freedom from

crystallization. The bolts are 2 inches in diameter and about 6 feet long. They were rolled hot from a 9 per-cent aluminum-bronze billet, and the head was upset while hot in the usual manner. The tensile-strength of the bolts was about 60,000 lbs. per sq. inch.

Some of the difficulties met with in working aluminum-bronze hot were encountered in making seamless tubes from it. These were first made by the Mannesmann process from a solid billet without difficulty, but afterwards

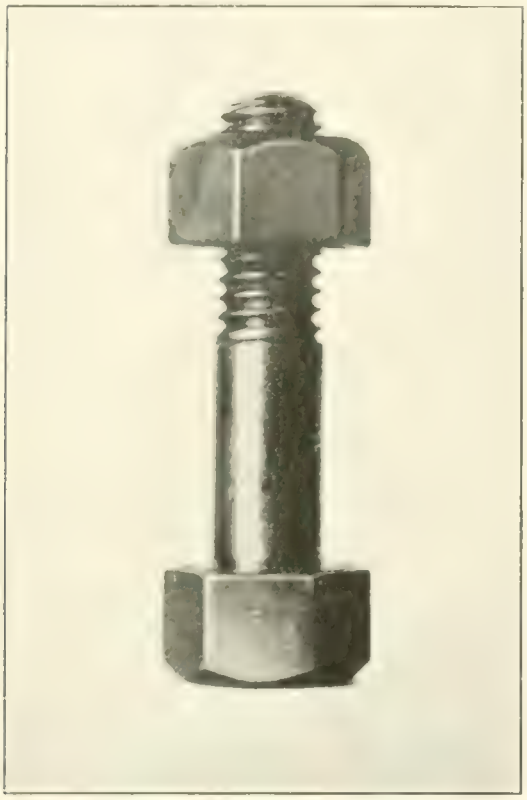


Fig. 6. Hot-Forged Aluminum-Bronze Bolt Containing 10 per cent. Aluminum. The Head Was "Upset."

it became necessary to make them from a hollow billet or shell. This shell was cast around a sand core. Much difficulty was found in casting it upright like a brass tube shell, and the method was finally adapted of casting it partly in sand and partly in a chill. A horizontal sand mold was made and a long runner given the casting. A skim-gate was also used to keep the dross back. When the mold was ready, a cast-iron chill was set in and the cope closed. The aluminum-bronze then had very little drop and could be poured quietly so that little dross formed. The shells were quite clean. Some of them are shown in Fig. 1. These were hot rolled and cold-drawn into seamless tubes.

One of the early difficulties met with in making the tubes was the formation of season-cracks. It was found that the same drafts were given the tube in the cold drawing which were used for soft brass. Aluminum-bronze hardens more rapidly than brass in cold working, and the bronze actually became fatigued so that it had practically no elongation. This was readily obviated and no further trouble resulted.

For rolling into sheet, the lower percentages of aluminum bronze are generally used for the reason that they are softer and allow cold rolling to be done without difficulty. It is possible to roll as high as 10 per-cent, provided it is "broken down" hot and then rolled in packs. In Fig. 2 is shown some 10 per-cent aluminum-bronze sheet which was rolled hot to one-eighth of an inch in thickness and then cold rolled to 0.050 in. Frequent annealing was, of course, necessary.

The highest percentage that can be successfully rolled is the 8 per-cent alloy. This is usually cast in an open mould like that used for copper, the top and bottom planed off, and then it is rolled hot to ½ or¼ inch, annealed, pickled and finally rolled cold to produce a good surface and even gauge.

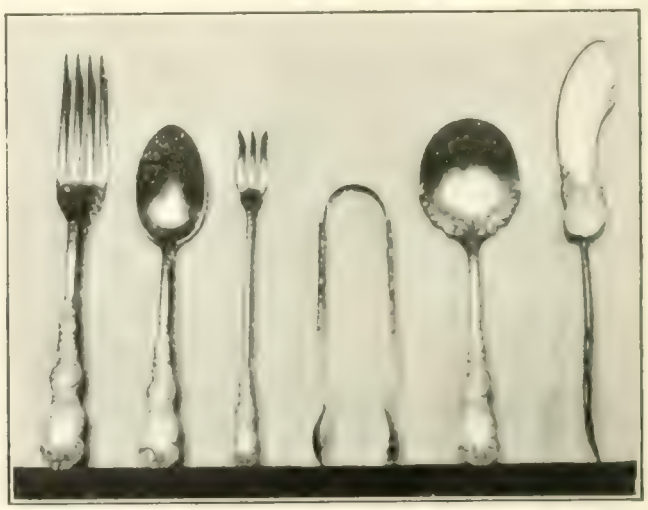


Fig. 7. Flat-Ware Made of 4 per cent. Aluminum-Bronze One of the Uses for Which Aluminum-Bronze is not Fitted.

The toughness of aluminum bronze is probably greater than any metal except steel. In Fig. 3 are shown some chips that were planed from a cake of 5 per-cent aluminum-bronze. It will serve to indicate how tough it is.

In Fig. 4 is illustrated a long chip of 4 per-cent aluminum-bronze, turned from a round billet cast in an iron mold. The homogeneity of the metal is remarkable and the chip showed little tendency to break. The tough-

ness of the bronze is such that it requires special treatment in working in presses. It shows a tendency to adhere to the dies, but by a modification of treatment it is possible to draw it. In Fig. 5 are shown some cartridge shells made of 5 per-cent aluminum-bronze and which will indicate that it is possible to draw it on a press for there is no more difficult drawing operation than that of cartridge making.

One of the features of aluminum-bronze early noticed was its rich color. The 5 per-cent alloy has a color similar to 18 karat gold, while the 4 per-cent mixture resemble a 14 karat very closely The 4 per-cent color proved so attractive that at one time thousands of spoons, forks, knives, etc., were made of it and sold. While they possess great beauty when freshly polished, they tarnish and corrode readily so that the craze was soon over. It is a use that never should have been made of the bronze. While the color of aluminum-bronze is attractive, it is not to this property that it owes its value, but to its strength, homogeneity, and freedom from crystallization.

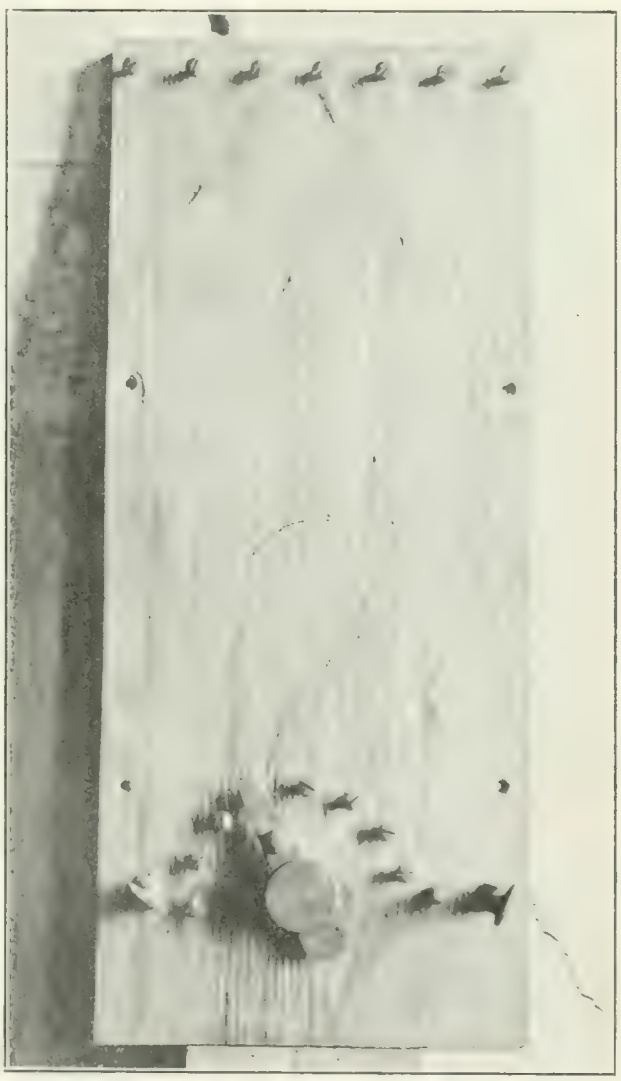
Were it not for the difficulty in casting aluminum-bronze, it would undoubtedly be very extensively used. It is a structural material that may be relied upon provided good castings are produced, but the factor of uncertainty is so great in making them, that it has greatly militated against its commercial production.

An aluminum alloy has recently been patented in France and which consists of the following: Aluminum, 94 to 98 per-cent; copper, 1.5 to 4.00 per-cent; manganese, 0.25 to 1.25 per-cent; and silver, 0.25 to 1.25 per-cent. It is claimed that the alloy can be rolled and drawn and is then much stronger than pure aluminum. The rolling may be done hot or cold.

Wrought iron may be distinguished from steel by etching in sulphuric or muriatic acids diluted with water. The wrought iron, after etching for some time, will show a very fibrous structure resembling a bundle of fine wires. This method is practically the only one that can be used, as chemically wrought iron and steel (so-called) may be the same although made in a different manner.

Wire for Rheostats.

Many platers make their own rheostats for reducing the strength of the current and it is not a difficult matter to do. The rheostat is designed to suit a particular line of work and it is difficult to make one rheostat that will answer for all kinds of work on account of the great range of the current. In some instances it may be necessary to use a few amperes, while in another several hundred are employed.



Home-Made Rheostat Showing German-Silver Wire Broken by Crystallization.

All electric conductors offer some resistance to the passage of the current. In other words, there is no substance which allows the electric current to pass without resistance. Copper is the best conductor and for this reason is not suited for making a rheostat, although it can be used by employing a sufficient length. Iron,

brass, German-silver, and nickel all have a much less conductivity than copper, and for this reason the same resistance can be obtained from them by the use of shorter lengths. For example, let it be assumed that the conductivity of a steel wire is 10 (copper is always assumed as 100). This means that it has 10 per-cent of the conductivity of copper, and that to obtain the same resistance only one-tenth as much needs to be used. A wire of such steel 1 foot long would offer as much resistance as 10 feet of copper wire the same size. It will readily be understood, therefore, that to make a rheostat of copper wire, ten times as much wire would have to be used as when made of steel.

In making a rheostat a wire with as much resistance as possible is desirable as shorter lengths can be used. Among the common metals and alloys, brass, German-silver, iron and steel, and the various nickel alloys belong to the so-called high resistance materials. German-silver has been a favorite for the purpose, but its use is not advisable on account of its liability to crystallize and break in service. In the illustration is shown a home-made rheostat upon which German silver wire was used. This crystallized and broke in a few months.

The same rule applies to brass as regards crystallization. It should not be used. Any copper alloy containing zinc is to be shunned, and electrical instrument makers have now fully realized that such alloys cannot be relied upon. In the case of rheostats upon which large wires are used, the crystallization does not take place as rapidly as it does when fine wires are employed.

The best wire for rheostats is one made of nickel alloys, such as cupro-nickel or nickel and manganese, as these have a high resistance, do not corrode or crystallize, and have a high melting point. They are, however, more expensive than German-silver and are not so easily obtained.

For ordinary work iron or steel wire is to be recommended. It has nearly as high a resistance as German-silver and will not melt when the temperature becomes too high. The only difficulty in the way is its liability to rust, but this can be offset by the use of graphite or a suitable paint. The rusting usually does no harm and unless the appearance is unsightly, it can be allowed to take place. The resistance is not affected.

Effect of Chromium on Brass.

Although chromium is one of the common elements and now extensively used in steel alloys, it has not been used to any extent in copper alloys and then only in an experimental way. S. C. Peck and W. R. Hodgkinson of London, England have recently patented a method of adding chromium to brass (U. S. Patent 943,159, Dec. 14, 1909). They have patented only the method of introducing the chromium and not the alloy produced.

The method is as follows: Chromium phosphate is heated with charcoal and copper and a chromium phosphide produced. This is used for adding to brass for the introduction of the chromium. The heat need not be high to bring about this reaction. Brass may be used instead of copper as the following experiment carried out by the inventors indicates: 2000 grams of brass containing 70% of copper and 30% of zinc were melted in a crucible with 200 grams of a mixture of equal parts of chromium phosphate and powdered charcoal added. The whole was heated to 1000° C. for some time and 200 grams of the chromium phosphate mixture again added. This was repeated after several hours, and after four hours had elapsed, the mass was poured into a mold. The metal contained chromium phosphide which was used to add to brass to improve it.

As an indication of the increase in the strength of brass containing chromium, the following experiment was made by the inventors: 1516 grams of copper were melted in a crucible and 655 grams of zinc were then added. When mixed, 82.5 grams of the chromium brass, made in the previous experiment, were added. The whole was thoroughly stirred and after twelve minutes the metal was poured into a round, iron mold. Another sample of brass was made of the same mixture but without the chromium. The two bars were tested with the following results:—

Chromium Brass

Tensile Strength ..... 42,500 lbs. per sq. in.
Elongation ..... 7.5% in 2 in.

Ordinary Brass

Tensile Strength ..... 32,256 lbs. per sq in.
Elongation ..... 38.5% in 2 in.

From these results it would seem that the chromium increases both the tensile strength and elongation. The amount of chromium in the brass is not given by the inventors.

Notes on Some Useful Chemical Apparatus that Can be Employed in the Plating Room With Good Results.

As electroplating is more of a chemical science than an electrical one, a plater will find some of the simple forms of chemical apparatus of value. Some platers do not have them. Others have them but are not familiar with their right use. A little knowledge on the part of a plater regarding chemical apparatus will usually be found quite handy as he will be able to use it for many operations in which chemical manipulation is involved.

Fig. 1. An Assortment of Porcelain Evaporating Dishes.

Evaporating Dishes.

Evaporating dishes are quite essential in the plating room. They are used for heating solutions, for evaporations, and for plating with hot solutions such as gold baths. It is poor economy to attempt to purchase cheap porcelain ware. There is not much difference between the best grade and the cheapest, as far as price is concerned, and while the best will give excellent service, the cheap grade is thick and and quite apt to break in heating. The best dish is made in Germany and is known as the Royal Berlin Porcelain. They are thin and stand sudden changes of temperature remarkably well. In Fig. 1 are shown a number of sizes of such dishes. They may be obtained in the trade in sizes ranging from 2¼ inches in diameter and holding one-half an ounce up to 18 inches in diameter and holding 4 gallons. Some eighteen different sizes are made so that any desired capacity may be had. They range in price from twelve cents each for the smallest size up to $14.00 for the 4 gallon size. A 12 inch dish is quite handy. It holds nearly a gallon. Its cost is about $2.75.

Evaporating dishes, except in small sizes, should not be heated over a naked flame. Even with the small sizes, there is some danger if care is not used, and unless one understands the subject, it is advisable to use a sand-bath. For the large sizes, the sand-bath should always be used. There is then little danger of cracking the dish.

In Fig. 2 is shown the method of heating an evaporating dish by means of a sand-bath. The sand-bath itself is simply a shallow dish of sheet iron. An old tin pan or enameled iron dish may be used as long as it is not soldered together. It is filled with sand and the dish set down into it evenly so that the sand comes in contact with the bottom. The whole is heated by a gas stove or any other desired means at hand. The object of the sand is to allow a gradual and uniform heating. If a naked flame is applied to the dish, the heat is too fierce and uneven, and under such circumstances the dish is apt to crack. A water-bath can also be used but it is not as convenient as the sand.

The best porcelain dishes are glazed on the inside so that they are readily kept clean.

All kinds of solutions can be used in them, acid or alkaline, without danger of attacking them. The strongest acids, even when hot, have no effect on them. They are far more non-corrosive than glass, and while strong, hot potash, for example will attack glass, it has no appreciable effect on porcelain. Porcelain also stands sudden changes of temperature better than glass and is not as apt to crack during heating.

chemical laboratories are in general use. They are really evaporating dishes with a handle. The handle is quite convenient for holding the dish, particularly when hot. In Fig. 3 an assortment of casseroles is shown. They are made of porcelain like the evaporating dishes.

Fig. 2. Method of Heating a Porcelain Evaporating Dish on a Sand Bath.

The same care should be used in heating casseroles as that followed with the evaporating dishes. Use only the best porcelain made as they will be found the cheapest in the end. The Royal Berlin is by far the best. Cheaper casseroles with wooden handles are not very satisfactory. They are thick and do not stand heating very well.

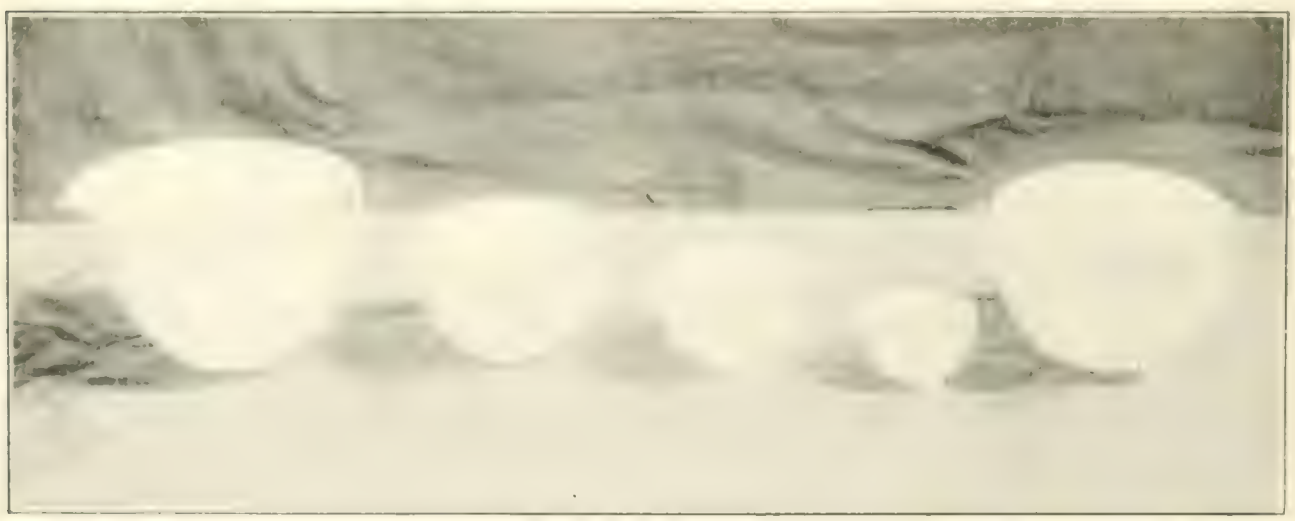


Fig. 3. An Assortment of Porcelain Casseroles.

Casseroles are one of the pieces of apparatus with which the plater is usually not very

Casseroles are not made in large sizes, as the weight of the liquid in them would then be too much for the handle to hold. The largest size holds about 2 quarts and is about 7 inches in diameter. For small sizes, casseroles are generally used in place of evaporating dishes as they are easier to handle. For the sizes above 2 quarts, of course, evaporating dishes will have to be employed.

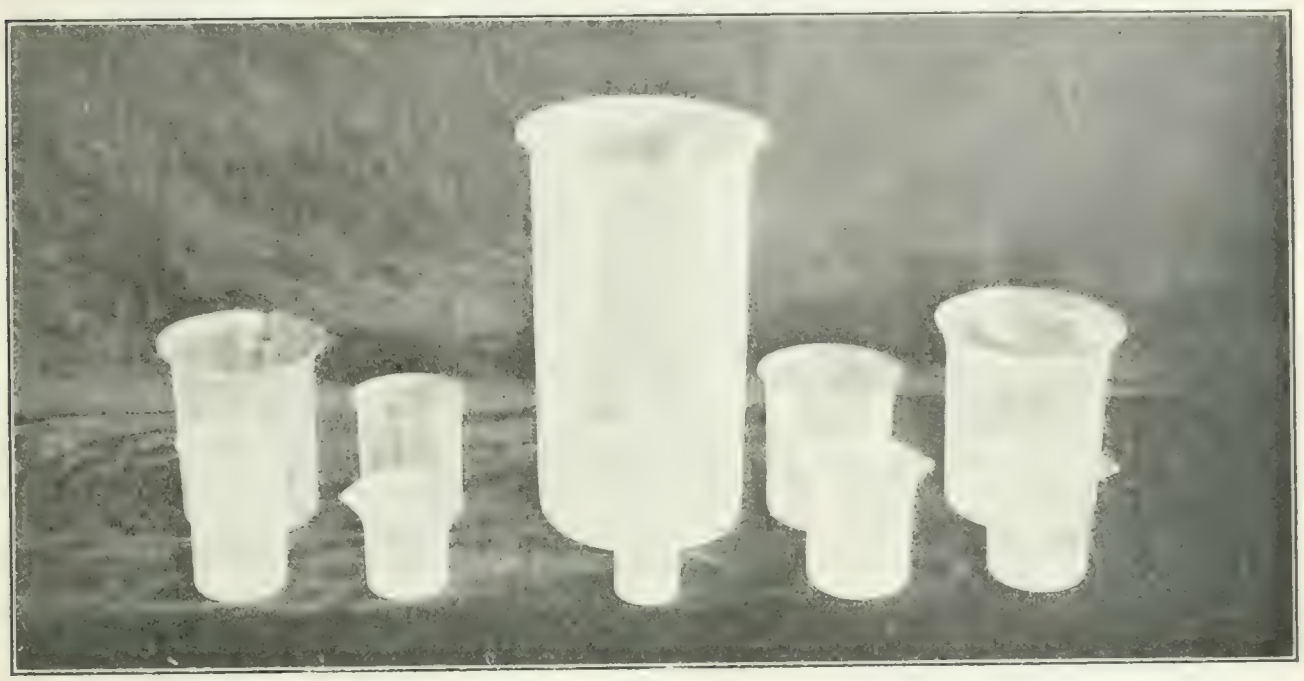


Fig. 4. Bohemian Glass Beakers of Various Sizes.

Beakers.

A beaker is a thin glass, cup-shaped vessel like those shown in Fig. 4. They will stand heating and liquids may be boiled in them. This may be done for the reason that the beakers are made of thin glass of a special composition intended for the work.

Beakers are made of the tall or short form, and both with and without lips. The various shapes may be understood by referring to Fig. 4. The tall beaker shown contains about two gallons. The lipped beakers are also known as Griffin beakers and are the most handy on account of allowing liquids to be poured out. The cost of those with and without lips is the same.

Cheap beakers should always be shunned as they are apt to break in heating. The best grade are those known as the Bohemian and are made in Bohemia in a wood-fired kiln from a potash glass. In this manner a glass that will stand sudden changes of temperature without cracking is obtained. They are necessarily made quite thin on this account.

The beakers are made in a large number of sizes. The smallest holds about one-half an ounce and is too small for general use. Some 15 or 20 sizes are sold on the market. The largest holds about a gallon.

The cost of a beaker holding a quart is about 40 cents. The gallon size costs 90 cents. Large beakers are not extensively used as they are quite fragile and the weight of liquid in them is such that great care is necessary. The sizes more extensively employed are those up to 1 quart.

Beakers are never heated over a naked flame as they are apt to crack. A sand bath is rarely employed for them, but they are placed on a piece of asbestos or wire gauze setting on a tripod as shown in Fig. 5. The bunsen burner is placed underneath. The asbestos is about ⅛ inch in thickness and is really safer than the gauze as the heat is transmitted to the beaker more gradually. The gauze used is made of coarse wire and of fine mesh so that the flame will not penetrate it. A special kind of gauze made of iron wire is sold for this purpose. The tripods used are handy and cheap. They are used for all sized beakers. Bunsen burners employed for heating are made in several sizes, but the small size shown in Fig. 5 is the one generally used. A larger burner containing four tubes is also made and this gives a heavy flame that may be used for heating a sand bath when desired.

Flasks.

Flasks are made of thin glass the same as beakers and are equally as carefully made. The Bohemian glass is the most satisfactory as it stands changes of temperature the best and is of even thickness. A word about the so-called Jena glass may be of interest. This glass is made in Germany and is of a special composition. Its coefficient of expansion is quite low so that it stands sudden changes of temperature far better than any other glass, even the Bohemian. It has come into use for chemical glassware; but, unfortunately, while the glass appears thick at the top, the

Fig. 5. Tripods and Method of Heating Beakers on a Piece of Wire Gauze or Asbestos Board.

more readily broken than the Bohemian. On this account, the Bohemian glass, which has been used for many years, still gives the best satisfaction.

beakers, as far as heating is concerned, but the large sizes should be heated by a sand-bath. For many purposes, particularly in the small sizes, beakers are handier than flasks. spattering, flasks are better than beakers. One must use his own judgment about the matter,

be used to prevent grit from being present underneath. This will frequently break the flasks or beakers, and if not may scratch them. board or asbestos. The asbestos board is by far the better as it is soft and hot flasks may be set on it without danger on account of its good non-conducting properties.

In purchasing flasks of the ordinary shape, obtain those which have a flat bottom so they will stand up alone. They are made of glass that is quite thin (the same as the beakers) and a thick flask should not be used as it is

as sometimes one can be used to the best advantage, and frequently the other.

In Fig. 6 an assortment of flasks is shown. There are a number of different kinds of flasks. The ordinary shape is that of the largest flask in the illustration. They are called the "ordinary" shape and are sent by dealers when other kinds are not ordered. A flask with straight sides and a lip is made. It is called a "beaker flask" and is handy for some operations. Another kind with straight sides but without a lip is called a "Erlenmeyer" flask. The ordinary shape, however, is the best for regular use.

apt to crack. The Bohemian glass ware is always of the right thickness. Flasks may be obtained in sizes from those holding half an ounce up to a 5 gallon size. The latter, however, is too large for ordinary use. It costs about $3.50. A gallon flask, costing 85 cents is about as large as the average plater will need. The pint and quart sizes, costing 25 and 50 cents each are also quite serviceable. If heated gradually on a piece of asbestos board, as described in the case of the beakers, there is little danger of breakage.

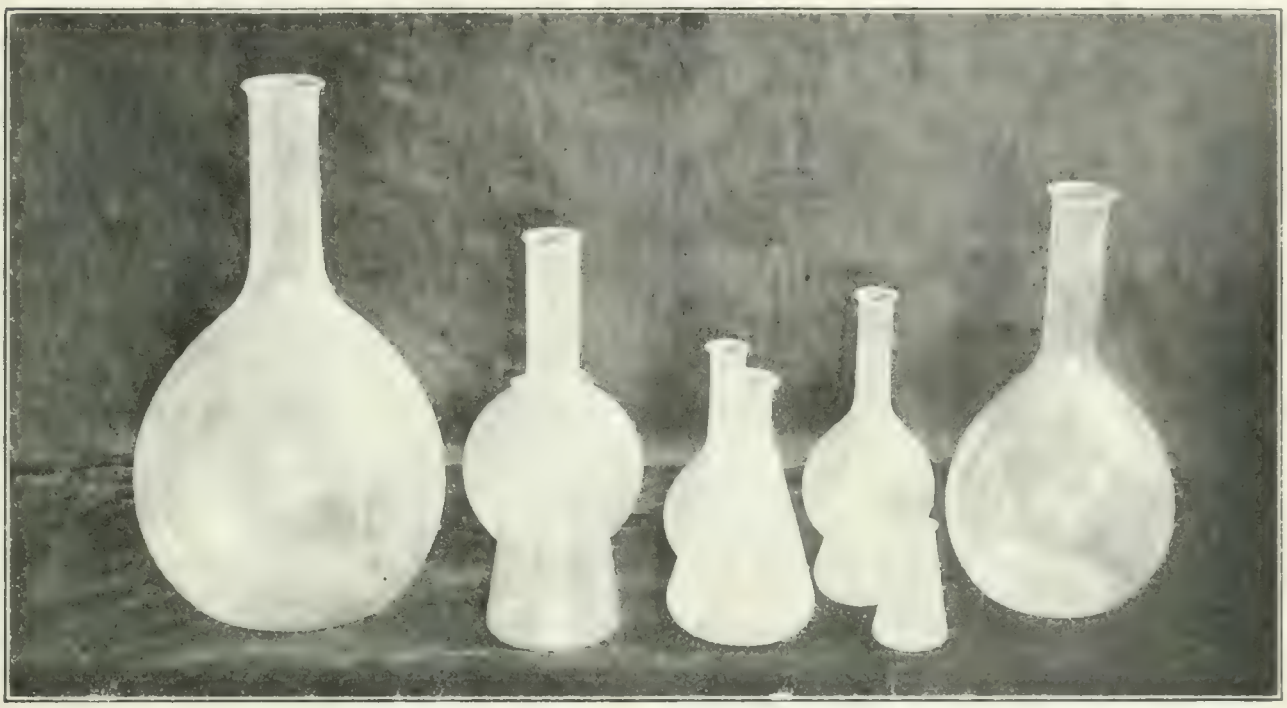


Fig. 6. Bohemian Glass Flasks of Assorted Sizes.

Mortar and Pestle.

Mortars of cast-iron answer for some things but not for others as many chemicals act on the iron. Porcelain mortars are generally used and are shown in Fig. 7. They are sold in varying sizes and the best are those which are *not* glazed inside. It is then easier to grind or powder a substance. They may be obtained in sizes from 2¾ inches in diameter to 16 inches. A 16 inch mortar costs $11.00 and a 2¼ size, 20 cents. A good size for ordinary use is one 6 inches in diameter and costing 90 cents. The small sizes have solid pestles, while the larger sizes have part wood and part porcelain.

Porcelain mortars cannot be used for pounding as they will break. They are used for crushing and grinding, although a slight pounding, when there is a crushing of the material to be ground in the bottom of the mortar, allows some pounding to be done. To know just how much they will stand, however, requires considerable experience.

Fig. 7. Porcelain Mortars and Pestles.

Funnels and Filtering.

Funnels of glass are one of the useful pieces of apparatus. The best form is without ribs, although the ribbed funnels filter a little more rapidly. They are rarely used in chemical laboratories, however, for the reason that it is difficult to wash material clean in them.

The material to be washed out remains between the glass and the paper. The ribbed funnels are more of druggist's apparatus than a chemist's, although for some kinds of filtering they are useful and rapid.

Funnels may be obtained in sizes ranging from one an inch in diameter at the top to the 12 inch size. The 12 inch funnel costs $1.35. For ordinary use, an assortment should be had. The following sizes will probably answer all requirements: 3 in., 5 in., 6 in., 8 in., and 10 in. The 3 inch size costs 12 cents and the 10 inch size, 90 cents. The others are intermediate in price.

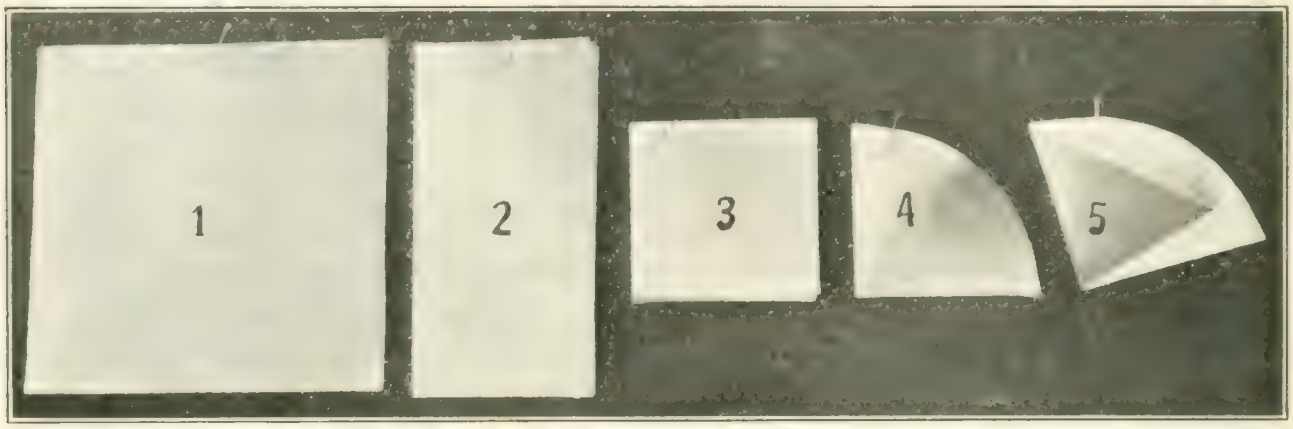


Fig. 8. Method of Folding Filter Paper for Filtering.

Filter paper is usually employed for filtering, and the white grade is the best. It is sold in large sheets which may be cut up as desired. The method of folding a filter is shown in Fig. 8. A piece of the paper is first trimmed square as in 1. It is then folded over once as in 2, then again as in 3. The top is then rounded as illustrated in 4. It is then opened out as shown by 5 and inserted in the funnel. The paper is held down to the sides of the funnel with one hand and then wet with water and the excess poured out. In this manner the paper will line the sides of the funnel smoothly. There should be no wrinkles on it, and if they are present, press them out with the fingers. The filtering is done by the apex of the paper only so that the rest should lie close to the glass. As funnels are not heated, they are made of rather thick glass and are usually of American glass which stands quite well.

To filter, some sort of a stand is necessary to hold the funnel. One is shown in Fig. 9. The paper should not project above the top of the funnel as it is then difficult to wash the material in it clean. It should not reach over an eighth or a quarter of an inch from the top.

Hydrometers.

Hydrometers are made of glass, sealed up hermetically and with a scale inside. They are used to test the strength of solutions. They are made in two kinds: One for liquids, such as alcohol, ammonia, gasoline etc., which are lighter than water The other, or that

Fig. 9 Manner in Which Filter Paper is Used in Glass Funnel.

generally used in the plating trade, is for liquids heavier than water. The one generally in use by platers has what is known as the

Beaumé scale which is an arbitrary scale. Chemists usually employ hydrometers which show specific gravity direct, but both hydrometers are used the same and made the same. The only difference is in the scale. One is

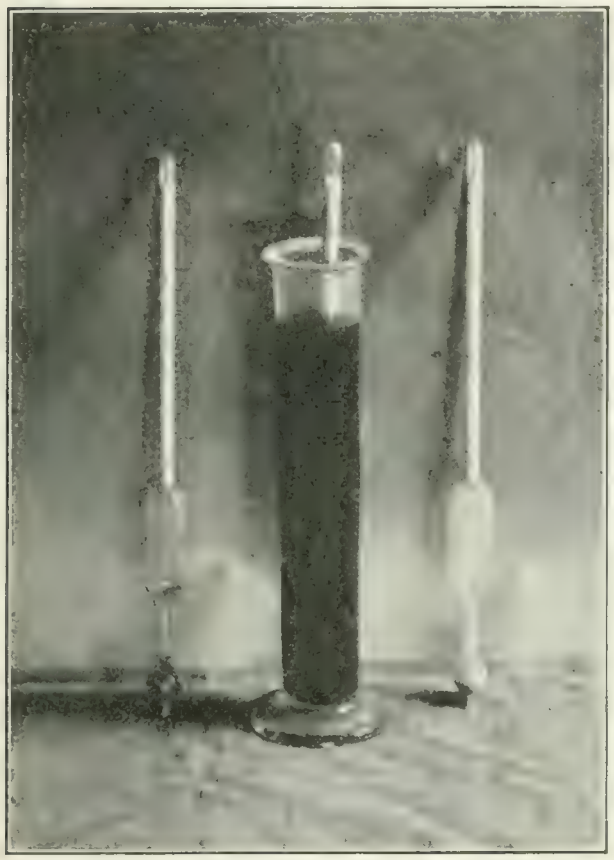


Fig. 10. Hydrometers and Glass Jar.

readily changed to the other. For example, 10 degrees Beaumé is equal to 1.072 specific gravity.

A glass hydrometer jar or cylinder shown in Fig. 10 should be had for using with the hydrometer. It is filled with the liquid to be tested and the hydrometer placed in it. It enables one to take the whole to the light and thus read the hydrometer scale to the best advantage. In many cases, where the light is good, the hydrometer may be placed directly in the plating solution, but the glass cylinder is better for general use. They do not cost much and may be obtained both with and without a lip. Do not purchase one too short as it will not contain sufficient solution, particularly when weak solutions are tested, to float the hydrometer. One 12 inches high usually answers although for weak solutions one 15 or 18 inches high may have to be used. The cost of a 12 inch cylinder is about 45 cents. They should have ample room inside; from 2 to 3 inches in diameter is preferable so that the hydrometer will not hit on the sides of the glass. The bottom of some hydrometers is filled with shot to sink them, while others contain mercury. One is equally as good as the other.

Stirring Rods.

Stirring rods are made of glass and are useful to stir or mix solutions. They are easily made. Glass rods are obtained in short lengths from dealers, as shown in Fig. 11. They are easily cut by scratching with a file and breaking with the hands like a stick of wood. Place the fingers as close to the scratch as possible.

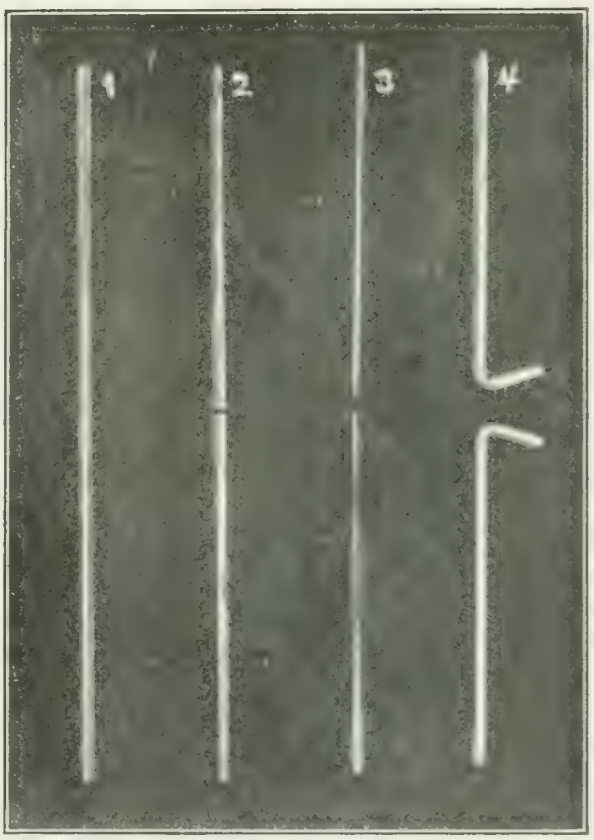


Fig. 11. Evolution of a Glass Stirring Rod, Showing Manner of Making from a Glass Rod.

The ends of the rod are easily rounded, to prevent scratching the bottoms of the vessels in which it is used, by holding in the flame of a good bunsen burner. The glass will melt at the edges and if the flame is hot enough, it will make a nicely rounded end. In inserting the rod in the flame it should be gradually heated to avoid breaking.

A good rod is one with the ends bent over as shown in Fig. 11 as it serves for a handle. It is unnecessary, however, although con-

venient, and a straight rod may be used if desired. Both ends of the rod should be rounded in the flame. The glass rods are obtained in sizes from 1/16 in. in diameter to 1 inch. A good size for the plating room is the one about 3/16 or ¼ in. in diameter. Glass rods are sold by the pound and may be obtained assorted if desired. They are usually sold at about 50 cents per lb. regardless of the size.

"Aluminum" Coated Sheet Steel.

For some time a material called "Aluminum Coated Sheet Steel" has been extensively advertised and sold to be used in place of galvanized iron. It has been a somewhat general opinion that the sheet metal is coated with aluminum but this is not the case. In a patent recently issued to John Wilder of the Wilder Metal Coating and Mfg. Co., of Connellsville, Pa., who make the sheet metal (U. S. Patent 942,803, Dec. 7, 1909) the method of making it is described.

An alloy of 78% of zinc, 7% of aluminum and 1½% of copper and 13½% of tin is used for the coating metal. The sheets to be coated are cleaned by pickling or otherwise in the same manner as that employed for tinning or galvanizing. The same flux is also employed. The alloy is melted in an iron kettle and the sheet steel, previously immersed in the flux, is introduced when it becomes coated with the metal.

The advantage of such a coating, the inventor says, lies in the fact that, while it protects the steel from corrosion, it will not peel or strip when the metal is bent and a heavier coating than it is possible to produce by zinc alone can be obtained. The color of the coating, too, is an advantage as it is almost silver white and bright. The molten metal is used at a temperature of [illegible] degrees F. It is claimed that less dross is produced than [illegible] is employed in [illegible].

The [illegible] of plated sheet metal goods is frequently caused by blisters on deposited metal. Cast metal goods do not blister as readily during plating as the surface is not generally as smooth and a smooth surface blisters more easily than a rough one.

Nickel and Manganese Alloy for Electrical Resistance Work.

A new nickel and manganese alloy for use in electrical resistance work has recently been patented by Wilbur B Driver of East Orange, N. J. (U. S. Patent 943,066, Dec. 14, 1909). Mr. Driver has made a study of resistance metals for many years and has arrived at the conclusion that the alloys of nickel and manganese, particularly when the nickel is in excess, answer the requirements of a resistance metal to a remarkable degree. An electrical resistance material should have three qualities: 1. It should have a high electrical resistance so that long lengths of wire or sheet will be unnecessary. 2. It should be as non-corrosive as possible. 3. It should have a high melting point. The nickel and manganese alloy would seem to answer these requirements as well as could be desired.

The inventor makes the following remarks upon metals used for resistance purposes:

"Pure nickel has a comparatively low resistance, only about 12 microhms per cubic centimeter. A mixture of 95% nickel and 5% of manganese has an electrical resistance of 25 michroms per cubic centimeter or twice that of nickel. An alloy of 80% nickel and 20% of manganese gives a resistance of about 70 michroms, while one containing 70% of nickel and 30% of manganese shows 100 michroms. The melting point of these alloys is estimated to be in the neighborhood of 2500 degrees F. They are also quite non-corrosive when exposed to the air. They have the further advantage of electric stability, differing in this respect from the alloys of copper and manganese alone. The copper and manganese alloys seem to require one or more additional ingredients to "fix" their electrical properties, while the nickel and manganese alloys need no additional metal.

The alloy is adjusted in the proportions of nickel and manganese to suit various requirements. The more manganese it contains, the harder it becomes to roll or draw, but at the same time the resistance increases. Beyond 30% manganese the alloy begins to become too brittle to work. The inventor claims all mixtures of nickel and manganese from 5% manganese up to 40%. The alloys low in manganese are the easiest to work.

Method of Using the Universal Polishing Wheel.

By T. C. Eichstaedt.

I consider the "Universal" polishing wheel one of the money savers in the polishing trade if not the greatest one. It can be used exclusively in a stove factory and bull-neck, leather and felt wheels may be abandoned. This may seem idle talk, but it has been proved right here in Detroit, Mich., by the Michigan Stove Works who have been using the wheel exclusively for some two years. Seventy men are employed in the polishing room, and when the wheel was first used over half a ton of first-class bull-neck wheels was discarded. The writer has seen these piled up in the corner of the private room of the foreman. The saving which this concern makes in one year on wheels, glue and emery will serve to supply the other wheels for six or eight years. It is certainly worth the time of any foreman to try them and I feel that he will agree with me in my opinion. In order to assist those who desire to use them, I append complete directions for the work. A pair or more should be made for each man using the wheels.

The wheel itself is a modest looking affair, and one familiar with the polishing trade would call it one of the most inexpensive of wheels as it is made of the cheapest of sewed buffs. The secret of the success of the wheel, however, is in its make and the proper care and use of it. I am unable to give the reader the method of making the wheel as I am not familiar with it and do not happen to know the manner of manufacturing it. It is made up of buffs. The sections are treated with a preparation of glue sizing and allowed to dry thoroughly. They are then put together with another treatment of the glue and finally pressed in a wheel press under heavy pressure and allowed to dry.

Fig. 1. Polishing Room of the Michigan Stove Works at Detroit, Mich., Showing the Universal Wheel in Operation.

When used, the wheels should be obtained in proper widths and diameters for the work upon which they are to be employed. The bore or hole in the wheel should be about an eighth of an inch smaller than the spindle upon which it is to be used. The spindle may be oiled or greased and the wheel put on while it is revolving. In this manner a tight fit is obtained and after one has been put in, it will then go on again more easily.

When Used for Roughing.

For brass, steel, or malleable iron, a medium soft wheel should be used. When the wheel is new it may be a little hard, but it will soften up after using for a few days. It may be pounded to soften it, and in this case a flat piece of metal should be used in order to avoid denting the wheel.

To clean off the wheel after it becomes necessary from too much emery on the surface, use a large piece of pipe or a broken casting. When the emery has been completely knocked off, cut down with a buff stick, or use a universal wheel trimmer if one may be had. If a flat, smooth surface is desired, hold a piece of wet waste and a brick on the face of the wheel while running and allow to dry. Then set up in the ordinary manner. A 12 inch wheel, running at 1700 revolutions per minute will give the best results on stove work. The surface should be kept open with a steel-wire scratch-brush.

When Used as a Finishing Wheel.

The wheel is used the same as for roughing but is set up with a different grade of emery. Use No. 140 emery for malleable-iron or steel,

Fig. 2 The Polishing Wheel Room at the Michigan Stove Works, Detroit, Mich.

To set up when new, cut down with a piece of coarse sand paper while running, then size with a coat of flour glue to lay the nap. When dry, set up with two coats of emery which should not be too thick. After the wheel has been used and there is a body of emery on it, one coat is sufficient unless the work is hard, and if so, use two coats.

and if on brass for buffing set up with No. 120. Always true the wheel up after using, and with a buff stick and proper care, this wheel will run for months without being cleaned off.

Use the same method to clean off as employed for the roughing wheel, but true up with a buff-stick and then cut down with coarse sand paper. Finally hold a piece of wet waste on

the face of the wheel while running. Then allow to run for a few minutes until dry. Cut the glass off with sand paper, then size the wheel and set up when dry. Use a lump of pumice stone to keep the wheel open. A little care used in looking after the wheel will produce fine results.

If the wheel becomes too soft, roll the face in hot water and put into a press. If no press is at hand, lay a heavy iron weight upon the wheel for about two hours. This will harden it.

Oil Wheel.

If to be used on cast-iron, set up in No. 140 emery. For steel or malleable iron, use No. 160 emery. Oil of high viscosity or tallow should be used on the surface of the wheel. A polisher should have at least two of these wheels. After his day's work has been done, if it is still a good second oil or finishing wheel, he could then wash off the wheel he had used the day before and reserve the best one for the second oil wheel on the next day. The object of this procedure is that trouble with the glue may be encountered on account of the weather, and his oil wheel may break out. The second oil wheel is then had to fall back upon.

To clean off an oil wheel, cut down with a buff-stick and then wash off by holding a piece of wet waste on it. Hold a piece of brick-bat beneath the waste on the face of the wheel while running and keep the waste wet. For good results, always wash the wheel clean. When dry, size and set up in the ordinary way and then keep the face of the wheel open with a lump of pumice or sand-stone. The work is plated after it comes from this wheel.

Better results may be obtained by buffing work, after it has been electroplated, on a circular-sewed cotton buff. It is better than felt as the universal wheel makes a fine cut.

In Fig. 1 is shown the polishing room of the Michigan Stove Works of Detroit, Mich. Fig. 2 shows the polishing wheel room of the same plant. I am indebted to them for the courtesy shown in allowing the photographs to be taken. The wheel is the invention of Stephen Cochell, the foreman of the polishing room of this company.

In conclusion I may say that the secret of success in the use of the wheel lies in the care taken of it, the cleaning of it and in setting it up. The wheel will do more work than a canvass, felt or bull-neck wheel and any work that can be done upon these wheels may also be produced. The wheel is ready for setting up when received, with the exception of cleaning off the face so that the glue will hold.

Solution for Depositing Yellow Gold.

For the electrodeposition of yellow gold or the Roman shade, the formula of Roseleur is widely used. It is the one generally employed for ormolu work and is quite satisfactory. To-day, it is used without change in the original formula, although Roseleur employed it in 1846. The solution is made as follows:

Water	1	gallon
Phosphate of Soda	8	oz.
Bi-sulphite of Soda	1¼	oz.
Potassium Cyanide	⅛	oz.
Gold	2½	pennyweights

The gold is "cut" with aqua-regia in the usual manner and made into chloride before adding to the solution.

The solution is used warm at a temperature of from 120 to 150 degrees F. A platinum anode is preferably used and it is held in the hand while gilding. If the anode is allowed to dip but slightly into the solution, a pale color is produced. If immersed a greater amount, a yellow shade is formed, while a full immersion gives a redder tone. The work to be gilded is usually moved while in the solution.

The production of a yellow or Roman color on articles needs some care in order to obtain the desired shade. Let it be said that a yellow color cannot be obtained directly on copper or bronze unless a large amount of gold is put on. The copper red causes a red shade on the deposit. To obtain a rich, yellow color, the gold deposit should be put on brass of as near the color of the gold as it is possible to obtain.

Metals and alloys cast in chill molds always give a higher tensile strength than when cast in sand. In some cases, double the strength may be obtained.

Correspondence.

Melting "Monel-Metal."

[redacted]

I observed in THE BRASS WORLD, December, 1908, page 435, an article on the use of a flux in melting "Monel-Metal". I have been using this alloy for several months and my experience is in exact accord with your article so far as the melting of the metal is concerned. Various means have been tried to prevent what you describe, but so far without much success. We have used no flux for the reason that the people, from whom we purchased the metal, in their instructions said that clay-lined crucibles must be used, a cover placed on the crucible, and no flux, charcoal or other metal added to the metal while in the crucible, or while the melting is taking place.

Can you inform me if a plumbago crucible, or putting charcoal on the top of the metal before melting has any bad effect on it? The worst trouble I have had has been with the metal shrinking, but this is readily taken care of by the use of large risers and runners, such as are used for steel. The metal is melted in an oil furnace in which it is possible to obtain almost any heat required. I may say that in the oil furnace we are careful to use only a reducing flame. Although we are able to obtain fairly good castings, I am not altogether satisfied with them. In the light of the aforesaid article, it would seem as though the difficulty is caused by the presence of [redacted]

M. G. H.

(In melting "Monel-Metal" for making sand castings, a plumbago crucible can be used and charcoal employed on the metal. It is also advisable to use a flux. The small amount of carbon which is taken up does not interfere. In rolling, however, the presence of carbon is a detriment as it causes the metal to crack. You will find that the use of a flux will give you more liquid metal and freer from blowholes. The metal will also melt more rapidly. The flux dissolves the oxide which forms on the metal before it actually melts, and causes the individual pieces to unite without remaining in the pasty condition for some time.—[redacted]

White Solder for Brazing Steel and Iron.

In brazing steel or iron there is nothing better than silver solder, as it flows readily without oxide and at so low a temperature that there is very little danger of burning the metal. It has the property, too, of adhering tenaciously to the brazed metal. Its expense is the only objection to its use. Ordinary spelter solder, consisting of equal parts of copper and zinc, is extensively used in instances where the expense of the silver solder is objectionable; but its yellow color causes the brazed joint to become conspicuous and for this reason it cannot be used under all conditions.

A white brazing solder which may be used with good results on iron or steel consists of the following:

Copper	45 %
Zinc	45 %
Nickel	10 %

The use of the small quantity of nickel in the mixture gives the necessary whiteness and increases the melting point but slightly. Except for cheapness, this solder has no advantage over silver solder, and the latter is always preferable whenever it can be used.

Coloring Aluminum.

Aluminum is a difficult metal to color. Practically all of its compounds are white so that, in order to produce a black or dark shade on it, electroplating with another metal must be done and this in itself is difficult. Even though a satisfactory deposit may be produced, the oxidizing or color may remove it or cause it to blister or peel.

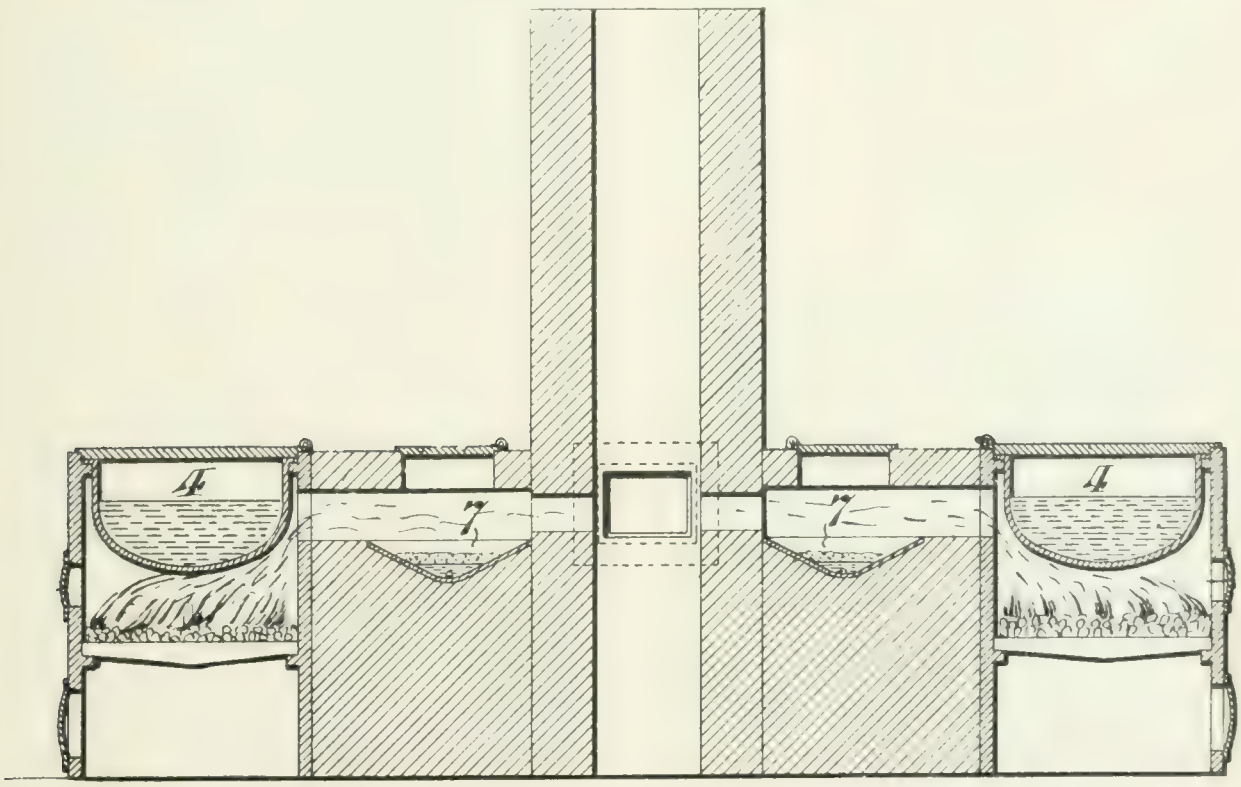
For coloring aluminum, colored lacquers will be found the best as they can be obtained dead or glossy and of any desired color. They are readily applied and are quite durable. After much experimenting and unsatisfactory experience in attempts to color aluminum in other ways, many manufacturers have now arrived at the conclusion that the use of lacquers is by far the best for coloring it, and are now using them with good results. Excellent examples of such work are found in aluminum optical goods made in France and Germany.

Combination Furnace for Smelting White-Metal Drosses.

When white-metals, such as type-metal, babbitt-metal, solder, antimonial-lead, or similar soft metal alloys, are melted, a certain amount of oxidation takes place on the surface where the metal is exposed to the air. As the oxide accumulates it is skimmed off. It is then called "dross."

The white-metal dross never consists entirely of oxide, but contains a considerable quantity of metal in the form of shot. Dross is really a mixture of oxide and metal. Ordinarily, this dross is sold by white-metal manufacturers and results in more or less loss on account of the metal it contains. A furnace has recently been invented by William C. Hyzer of Philadelphia, Pa. (U. S. Patent 943,248, Dec. 14, 1909.) which is intended not only to melt the white-metal, but to smelt the dross as well.

Referring to the illustration, a cross section of the furnace is shown. It is arranged so that two furnaces are served by one chimney. The white-metal is melted in the usual manner in an iron kettle 4 and the dross skimmed when ever necessary. In the flue, leading from the fire underneath the kettle to the chimney, a sort of pocket 7 is left. This is so constructed that the flame from the fire passes over it. The dross, after skimming from the kettle, is placed in the pocket 7. Not only is this portion of the furnace hotter than the others, but a reducing flame passes over the dross so that the metal in it is melted and a portion of the dross, at least, is reduced to the metallic condition. The metal settles down to the bottom of the pocket and is drawn off through a tap hole. This tap-hole is not shown in the illustration as it is situated at the side. It is simply a hole in the bottom of the fire-brick and is stopped by a fire-clay or iron plug. This is pulled out when it is desired to tap off the metal. Pure oxide and the impurities are left in the pocket, and are removed as desired. They have a market value and can be smelted to metal in the regular white-metal smelting furnace.



Furnace for Melting and Refining Dross in One Operation.

This furnace as herewith described is, in reality, more of a "sweating" furnace used in combination with a regular white-metal melting kettle.

Thick fire-brick linings in brass melting furnaces are always of advantage as they prevent waste of heat by radiation.

Correspondence.

Producing Matt Surface by Tumbling with Quartz.

Editor:

In connection with the application of colored celluloid enamels, both opaque and semi-transparent, we have usually recommended that the background be sand-blasted or matt-dipped. We find, however, that in many cases, factories do not have a sand blast, and all of them object to the matt-dip in acid on account of the nitrous fumes that are given off and which are quite objectionable.

In a number of cases, it has been noted that the trade has secured a roughened or frosted surface by tumbling the work with quartz, and then, if it looks a little rough, it is cleaned up by dipping in the regular bright, acid dip.

As it is only recently that we have heard of this method of producing this class of frosted or satin finish by tumbling with quartz, and as it has recently cropped up in half a dozen different cases, it is believed that some information in regard to the process and the manner of handling the work would be of interest to your readers. Of course, the proper method of handling the quartz and the work can be determined only by those who have actually tried it in practice. Would it not be a good idea to bring this before a number of your readers and secure their opinion in regard to tumbling with quartz, the method of procedure, size of quartz used etc.

It seems to us that it may be the result of bringing out a new line of finishes, somewhat different from buffed, sand-blasted or scratch-brushed work, and from samples we have that were finished in this manner, it is apparent that the process is cheaper than others and is quite simple to clean before lacquering. Much of it would be lacquered just as it comes from the tumbling barrel, and if any cleaning were done, it would only be necessary to dip in acid to even up the surface slightly, and not enough to remove the slight roughness. Then wash in clean water, dry, and the work is ready for finishing.

As powdered quartz is used in enormous quantities for wood filler, it certainly can be obtained very cheap, and if there is any appreciable demand it would quickly become a regular article of commerce. It will readily be appreciated that from the latter standpoint it is far preferable to the other methods, as work tumbled with leather, or indeed with steel balls, is covered with a film of grease or soap.

W. A Jones.

General Manager,
Celluloid Zapon Co.

Bronze Spinning Chucks.

For ordinary purposes, in which a spinning chuck is to be used only for a short time, it is customary to make it of hard wood. It will last for quite a while and then a new one must be made. It must be treated with considerable care, however, in order to prevent damage as dents interfere with the spinning.

For chucks of a permanent nature, it has been customary to use cast-iron which, although requiring more labor to make, lasts almost indefinitely and is not easily injured. This "indefinite" feature would be all right were not for the fact that it is seldom a design can be used for all time, and chucks then become obsolete. In the case of a cast-iron chuck the scrap value under such considerations is quite small, and it is a growing custom to use bronze chuck instead of those of cast-iron. The bronze should be more or less hard in order to avoid injury, and at the same time it must not be too hard or it cannot be turned into shape readily. A good, free turning composition mixture is good. The following may be used:

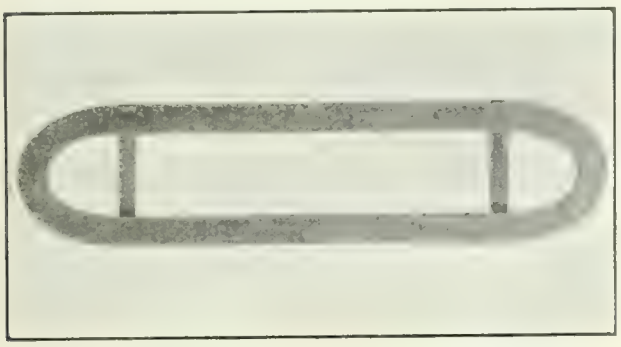
Copper	85%
Tin	7%
Zinc	3%
Lead	5%

The advantage of a bronze chuck is that it has a high scrap value when it can no longer be used. Establishments which have their own brass foundry can use the old chucks over again at the value of new metal. The advantage then is that the interest on the extra investment is the only cost of the bronze chuck over that of an iron one, and this more than offsets the small scrap value of the cast-iron.

Platinum deposits are always hard and cannot be scratch-brushed with a brass scratch brush The platinum is harder than the brass and the surface becomes coated with brass. A steel scratch brush should be used.

Spotting-Out of Oxidized Copper Goods.

Platers are frequently troubled by the "spotting-out" of oxidized copper goods after they have been lacquered and finished. If the goods are of cast metal it is generally assumed that the castings are porous, and it is usually the case. When the spotting-out occurs on sheet metal goods it is often quite perplexing. It is not infrequent that the spotting takes place some time after the goods have been lacquered and placed in stock and possibly sold. When it occurs, the effect is serious.



Oxidized Copper Plated Steel Buckle, Showing Spotting-Out on Account of Blistered Copper Deposit.

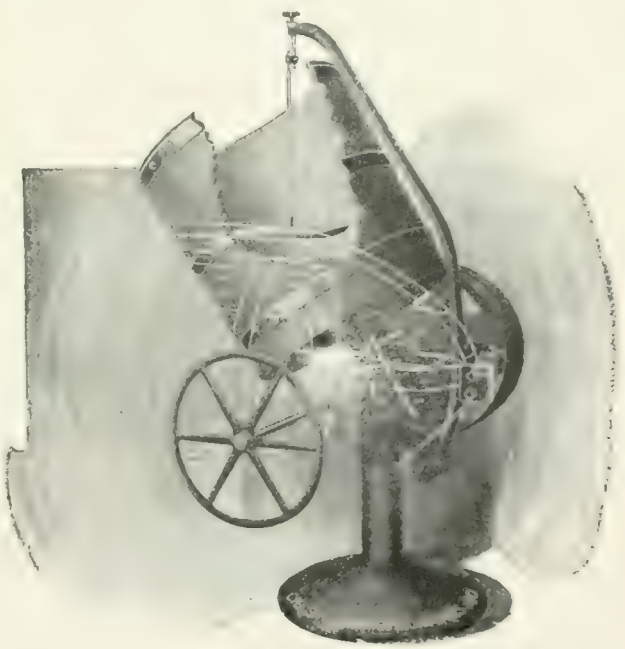
On sheet metal goods, particularly those of steel, which have been copper plated and oxidized by means of liver of sulphur, such spotting out may usually be traced to the formation of minute blisters in the coppering. These blisters hold a slight amount of cyanide solution underneath and this gradually works out (it may take some time) with the result that the metal is stained and the lacquer attacked.

In copper plating steel by means of a cyanide copper solution, blisters are apt to form if the solution is too strong, contains too much free cyanide, or too strong a current is used. In many instances all of these conditions are found and bad cases of blistering. In addition, the improper cleaning of the work aids the formation of the blisters. They may not be apparent to the naked eye, but nevertheless they are there and the result is the spotting-out.

Those who experience trouble with the spotting-out of oxidized copper work should look to this source as the cause of it. In the illustration is shown a buckle which spotted-out from such minute blistering. It was made of sheet steel, copper plated and then oxidized in liver of sulphur. Much annoyance was caused by the spotting and it was only after a considerable length of time that the cause was found.

The "Reliance" Plating Barrel.

Manufacturers who have small metal goods that are electroplated should investigate the merits of the "Reliance' plating barrel made by Chas. F. L'Hommedieu & Sons Co., 26 S. Clinton St., Chicago, Ill. This barrel is quite different from anything on the market and at once appeals to those who desire to plate metals in quantities. The barrel is not new and a large number are now in use in many large plants where they have given excellent satisfaction. The barrel is herewith illustrated.



The "Reliance" Plating Barrel.

The construction is simple. It consists of an oblique tumbling barrel designed so that it may be readily tilted, and the solution and work easily removed. The connection is made at the bottom of the barrel, and an anode is hung over the work.

The advantage of this form of barrel may be readily appreciated. In the first place, any kind of work may be plated. Unlike the ordinary plating barrel with holes through the staves, pins, rivets, studs, eyelets, etc., in large variety, and which would be too small to plate in the regular barrel on account of the articles

passing through the holes, may be plated with ease and rapidity. Any other kind of work may likewise be plated with equal facility.

The position of the anode is such that it is theoretically correct. The metal dissolved from it, on account of its weight, immediately settles to the bottom and allows fresh action to take place. It is a well established fact that the best position for an anode is directly over the work.

As the barrel is self-contained, requires no large amount of space, is easily manipulated and any kind of work can be plated in it, its advantage is at once realized. In addition to these features, another valuable one is that ordinary plating solutions may be used in it, and they require no change in formula to adapt them to it. The articles to be plated are placed in the barrel and the plating carried on in the usual manner. The work, as it is tumbled, is burnished and the brightness of the deposit increased. At the same time (unlike work done in baskets) there is no danger of portions of the surface not becoming plated as they are continually changing position.

The "Baird" Wire Forming and Stamping Machine.

The manufacture of small metal goods is one of the leading industries of Connecticut and the machinery for making them is also of equal importance. The Baird Machine Company of Oakville, Conn., are now manufacturing the machine herewith illustrated for use in producing formed and stamped articles from wire. Although the machine was originally designed for making hose supporters and suspender loops, it has found its way into other lines of trade. Articles which have been made upon it are illustrated in Fig. 2. The machine

The wire is automatically taken from the coil, is straightened, fed and cut off before it enters the forming dies, after which it is formed and stamped. The articles are fully finished and are delivered at the rate of 60 or

attention is required other than keeping the machine supplied with wire. At present the machine is built in two sizes. The smaller size makes articles that do not consume more

inches of wire and of a diameter not greater than 0.200 inch.

The machine may be readily adapted for the almost numberless variety of articles that are made of wire and the large amount of experience of the makers has been embodied in it,

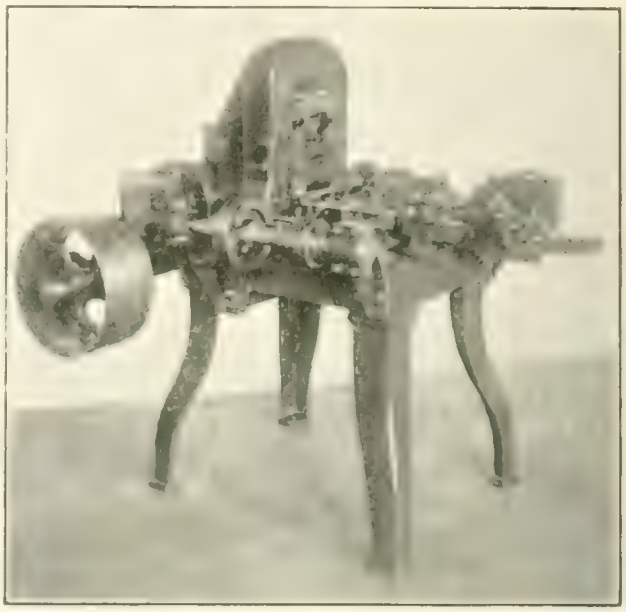


Fig. 1. The "Baird" Wire Forming Machine.

so that it is not only capable of turning out work of the character indicated, but without encountering any difficulty when used continuously. Every part of the machine has been carefully designed for hard service

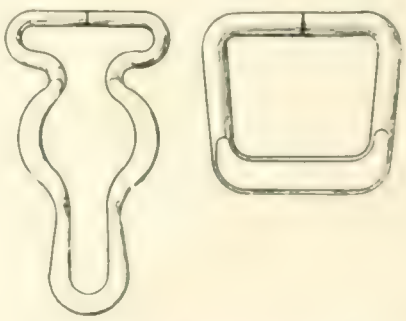
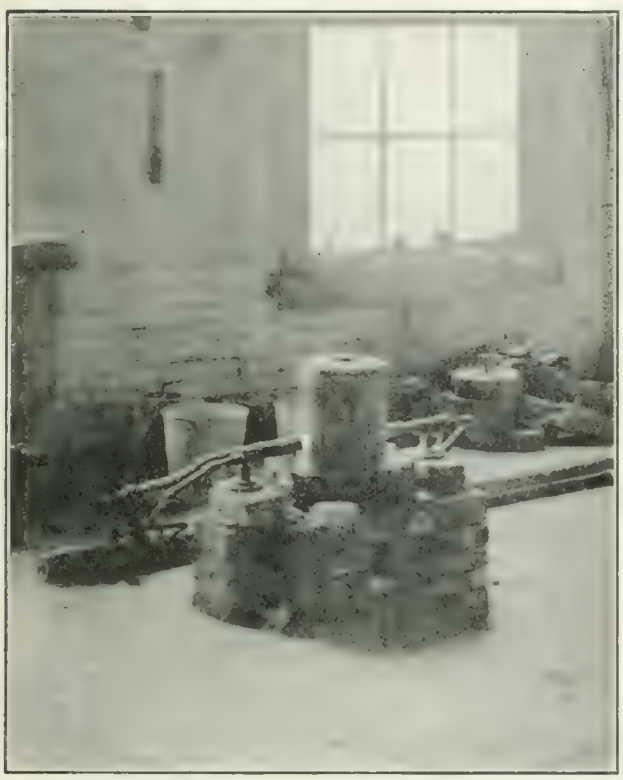


Fig. 2. Wire Goods Made on the Machine.

Small articles that are to be japanned, should be colored black by an oxidizing dip before japanning in order to prevent the metal from showing through. Japan, particularly in thin coatings, is not opaque. Brass goods may be oxidized in the ammonia and carbonate of copper dip, and steel goods must be plated with brass or copper and then oxidized. Eyelets, hooks and eyes, pins etc., are japanned in this manner.

Method of Dip Brassing Iron or Steel.

In The Brass World, November, 1909, page 403 was described in a preliminary manner, the process of Walter S. Rockey and Hilliary Eldredge of New York City, for brass or copper plating steel by the hot dipping process. Since that time, they have been granted patents upon the method (U. S. Patents, 943,161 and 943,630, Dec. 14, 1909).



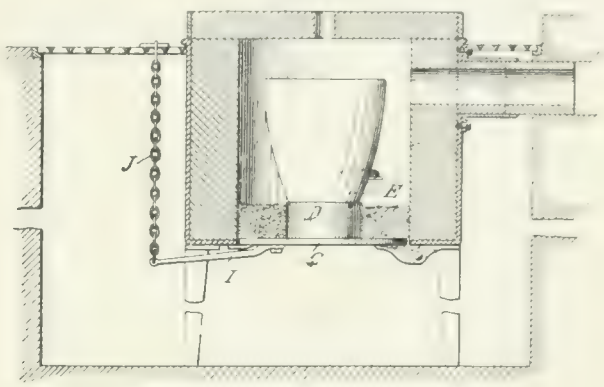
Experimental Furnace as Used by Messrs. Rockey & Eldredge in Brass Plating Steel and Iron.

The process consists in melting the brass or copper in a crucible and under a flux. The iron or steel to be coated is dipped into the molten metal through the flux on its surface. The flux prevents the oxidation of the metal and cleans the oxide while it enters so that a complete coating is produced. The inventors are now using a small gas furnace shown in the illustration for their work.

The flux patented for the purpose is either boracic acid or potassium chloride. It remains on the surface of the metal as a fused mass, and the metal after coating is covered with it, but it readily scales off by plunging into water.

An Oil Furnace with a Drop Bottom.

Believing that an oil furnace used for crucible melting should have a bottom that may be dropped like a coke furnace bottom, Garnet W. McKee of Chicago, Ill., has patented a crucible furnace using oil or gas (U. S. Patent 940,710, Nov. 23, 1909) in which the bottom may be dropped when a crucible breaks or when metal is spilled.



Oil Furnace with Drop Bottom.

The furnace is herewith illustrated and the bottom is held in place by a chain J and an arm I. The crucible rests upon a pedestal D and the bottom of the furnace is filled with sand or a similar refractory substance. By releasing the chain J the bottom may be dropped and any metal in the bottom of the furnace is then readily recovered.

Polishing Tubing Before Bending.

The custom of polishing tubing before bending is now becoming more prevalent than ever as it has been found that such a method offers many advantages. The polishing of tubing that has been bent is far more difficult than when the tube is in straight lengths. Indeed, it may be said that the polishing of straight tubing is a comparatively easy operation. It also allows a tube polishing machine to be employed with the best of results.

While the polishing of tubing before bending cannot be considered new, its advantages are not widely known. Even as long ago as the height of prosperity in the early 90's, bicycle handle bars were bent after polishing, as it was found that the polishing operation after bending resulted in cutting off so much metal from the rounded portions that the tube became weakened in a marked degree. Polishing

previous to bending obviated it.

The bending of the tube after polishing, of course, must be done without damaging the surface; but it is readily accomplished in nearly all instances. After bending, the surface is buffed to "color" and without injuring the tube at all as the buffing or even a light cutting down with tripoli does not take off an appreciable amount of metal. It is the heavy cutting down or polishing that removes the metal to such an extent.

A Safety Device for Metal Working Presses.

Presses are always a source of injury to their operators. In all factories where they are employed it is seldom that a number of employees cannot be found with maimed hands

Safety Device for Presses.

or one or more fingers gone. Carelessness is the cause, of course, and the operator himself is usually the only one at fault. In spite of this, however, accidents of this kind are to be regretted, as they not only cause permanent injury to the employee, but frequently result in the loss of experienced operatives.

A device has been patented by Charles F. Pfalzgraf of Baltimore, Md., for preventing accidents to a press operator. This device is herewith illustrated and consists of an attachment that is connected to the right arm of the employee so that when his hand is under the press, it is impossible to work the trip with the foot. Suitable electrical devices enable it to be done. It is intended to render the press "fool-proof" so that no matter how careless the operator may be, he cannot injure his hand in the press on account of the impossibility of starting it unless the hand is removed.

Obituary.

Charles B. Dudley.

With the death of Dr. Charles B. Dudley, which occurred in Altoona, Pa., on Dec. 21st, 1909, the country loses one of its most brilliant and able technical chemists. Dr. Dudley was born in Oxford, N. Y., in 1842 and graduated from Yale College in 1871. In 1872 he entered the Sheffield Scientific School of Yale College and graduated in 1874 with the degree of Ph. D. He was best known as a railroad chemist and served for 34 years at the head of the chemical and experimental departments of the Pennsylvania Railroad.

Dr. Dudley was, perhaps, known in the non-ferrous metal industry more by his researches in bearing metals, and his investigations along this line served to eliminate much of the fallacy that had previously been prevalent, and to set a pace for later investigation which have resulted in a vast amount of good to users of bearing metals.

The "Wallace" Plating Barrel.

A new form of plating barrel possessing particular advantages has been patented by George L. Wallace of Bridgeport, Conn., Eastern manager of the Dow Chemical Mfg. Co. (U. S. Patent 943,721, Dec. 21, 1909).

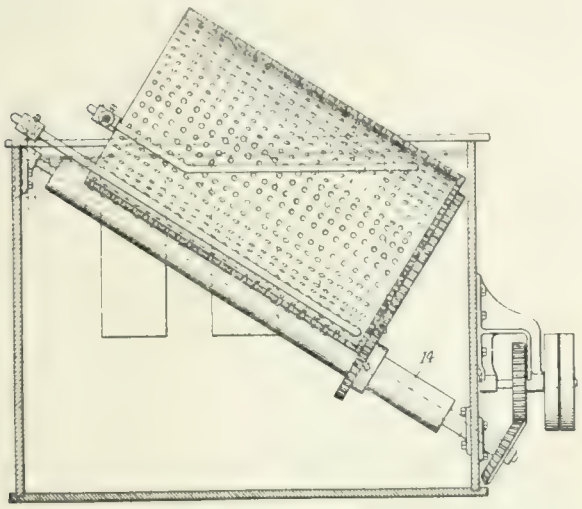


Fig. 1. Vertical Cross Section of "Wallace" Plating Barrel.

The barrel, herewith illustrated, is a combination of the oblique and horizontal types. The advantages of both types are thereby obtained. The large quantity of solution in the tank in which the barrel runs, supplies the necessary quantity for maintaining an even

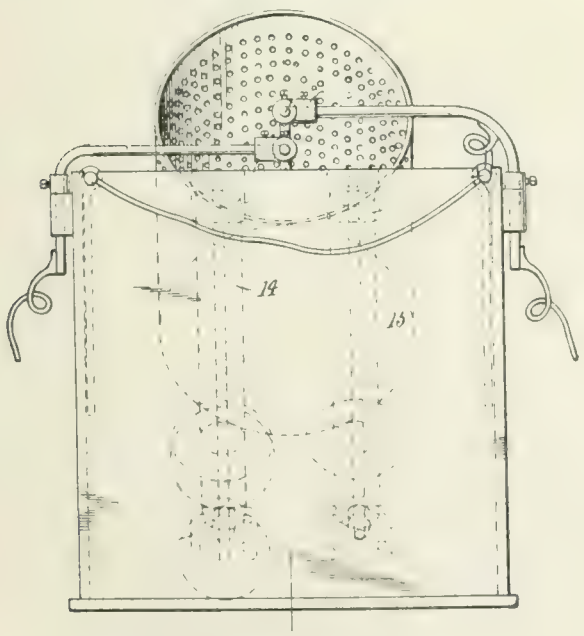


Fig. 2. Another View of Barrel.

composition. At the same time, the barrel is always accessible and the work may be inspected whenever desired. The barrel is shown with perforated sides. While this is advantageous for large work, for very small articles it is not desirable as the holes are either filled up by the work or it falls through into the solution. Such small work is plated in a barrel with solid staves. The solution is circulated in the barrel by means of a pump. In this manner not only may small articles be plated, but very rapidly on account of the agitation that takes place.

The barrel itself is made of wood or other non-conducting material. It rests upon two rollers, 14 and 15 in Fig. 2, one of which serves for the drive. These rollers are propelled outside of the tank by bevel gears so that there is nothing inside the tank to corrode and interfere with the plating operation. Anodes are arranged around the sides of the tank, and also in the barrel over the work.

Progress in Die Casting.

The manufacture of the so-called "die-castings" is rapidly increasing as many new uses have been found for them. The term "die-casting" as now employed, designates a casting made in a mold which will give a finished casting so that no machine work is necessary upon it. In other words, the casting is made finished.

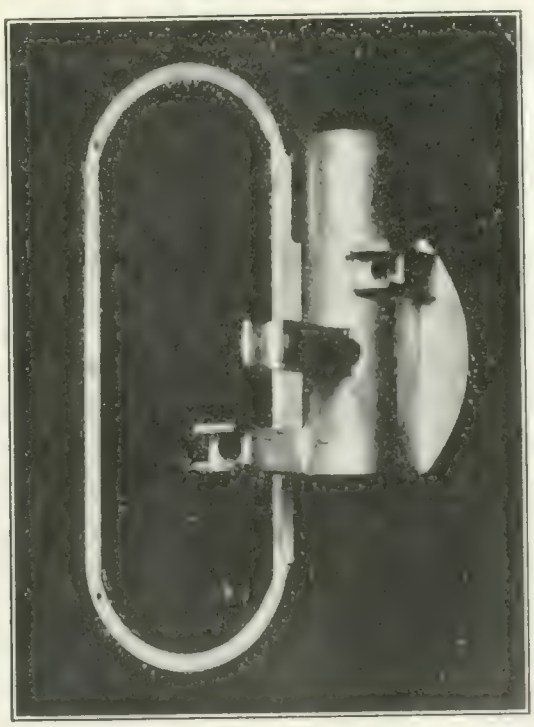


Fig. 1. Difficult Casting of White Metal Made in Die Mold.

While the art is not new, yet a large amount of progress has been made in it so-

that while in the early days of the business simple shapes only could be cast, now some quite complicated patterns are produced. In Fig. 1 is shown a casting recently made by the Doehler Die Casting Co. of Brooklyn, N. Y. This casting was made even with the small holes cast in it and finished ready for use. A strong white metal is used for the purpose.

Fig. 2. Brass Casting Made in a Die Mold.

In Fig. 2 is shown a brass casting also made by the same company and cast finished. This is one of the recent lines that has been taken up, and it is believed they are the first to make brass castings in the form of "die-castings".

A New Nickel Solution.

A new nickel solution has been discovered by Edward F. Kern of Knoxville, Tenn., who has assigned one-half to Percy S. Brown of the Western Electric Co. of New York City, (U. S. Patent 942,729, Dec. 7, 1909). The solution is novel in that it differs from the regular nickel plating bath in a marked degree. It consists of the following:

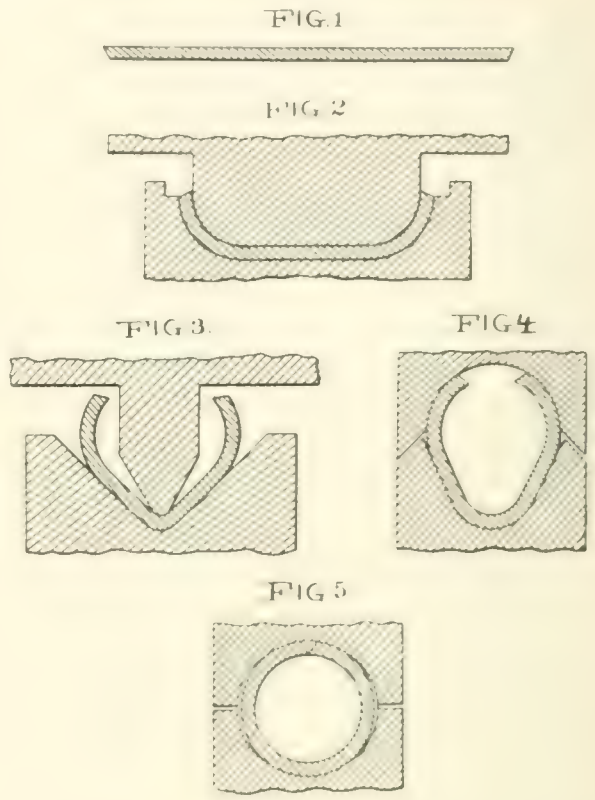
Water	1 gallon
Fluo-Silicate of Nickel	1 lb.
Ammonium Fluoride	½ lb.
Ammonium Fluo-Silicate	½ lb.

Ammonium fluoride is added from time to time to the solution as it serves to restrain the separation of silica. The solution is used in the regular manner with a nickel anode. The above proportions may be varied if necessary.

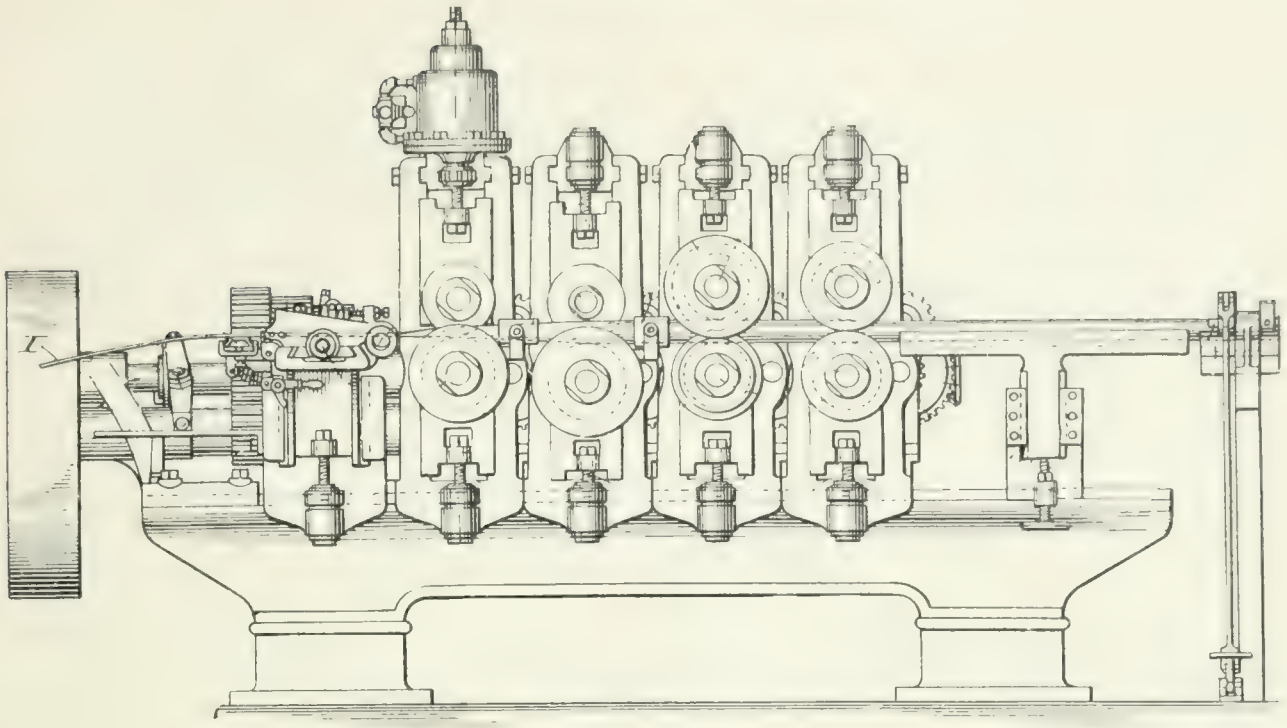
It is claimed that the solution gives a smooth dense nickel deposit which is coherent and adherent.

A New Method of Making Brazed Brass Tubing.

A new method of making brazed brass or other metal tubing has been patented by E. J. Steele of Torrington, Conn., and T. H. C. Hansen of Kenosha, Wis. (U. S. Patent 943,902, Dec. 21, 1909). The patent was assigned to the Coe Brass Mfg. Co., of Torrington, Conn.



The principle of the process may be understood by referring to Figs. 1 to 5. In Fig. 1 is shown the strip of brass or other metal of which the tube is to be made. The edges are scarfed by a pair of inclined circular scarfing knives. The tube is now formed by a series of rollers arranged as shown in Fig. 6. The sheet strip is passed though and is indicated at the entrance end by I. Four different rolls are used. Each successively forms the tube. These rolls are shown in cross-section in Fig. 2, 3, 4 and 5. The first roll, shown in Fig. 2, gives the strip and trough shape. The next roll, Fig. 3, sharply indents the bottom of the trough and forces up the strip. At the same time, it produces a strain in the metal which afterward serves to keep the edges of the tube from springing apart. In Fig. 4, a die-shaped roll partially forms the tube, and in Fig. 5 a similar roll completes it so that when finished it has a V shaped groove through the joint. This is intentional as it serves to hold the

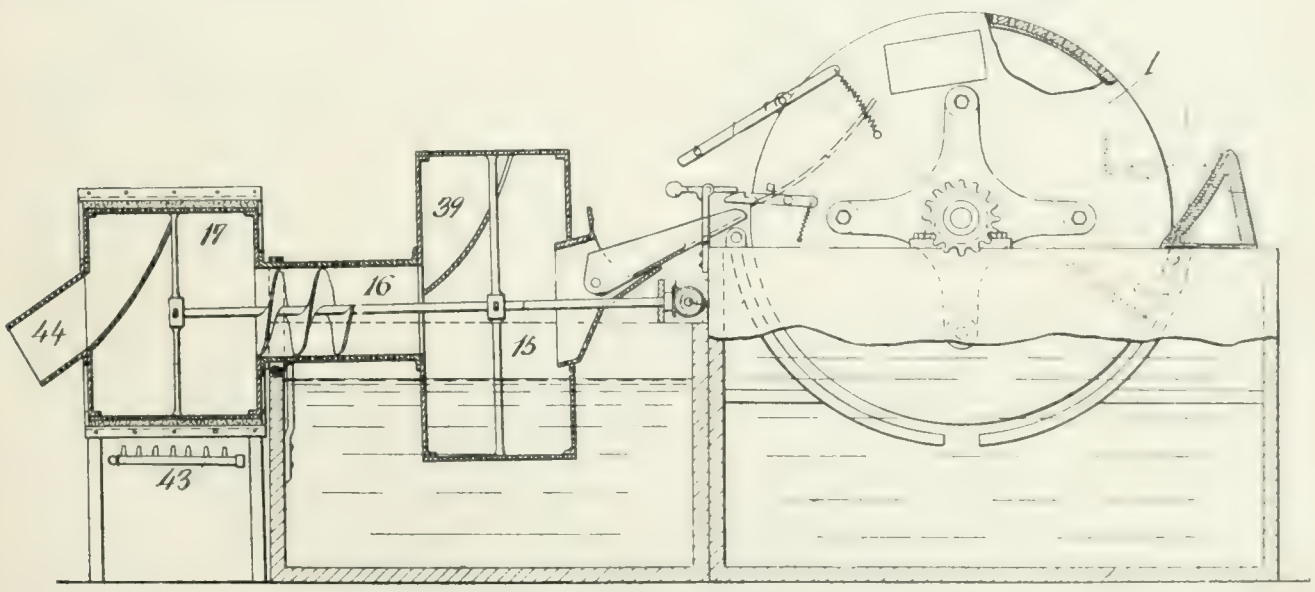


brazing solder. The feature of this invention lies in the fact that the method of forming the tube is such that it does not spring apart after being completed.

The "Potthoff" Plating Barrel.

The automatic electroplating apparatus which is herewith illustrated is the invention of Louis Potthoff of the U. S. Electrogalvanizing Co. of Brooklyn, N. Y., and is intended automatically to plate and tumble small articles in quantities. The apparatus has been upon the market for some time and has been installed in many establishments with excellent results. It has recently been patented (U. S. Patent 941,535, Nov. 30, 1909).

The barrel itself is made of wood and lined with cocoa-matting which the inventor has found to be excellent for the purpose as it does not impede the action of the current and acts as a polishing material upon the articles being plated. As the plating is taking place, the barrel revolves in one direction; but when it is desired to empty it, the direction is reversed and the articles are automatically dumped in to another and smaller barrel for rinsing. They are revolved in this and washed, and at the same time by means of a trap are automatically transferred to a drying barrel heated by gas or other means. In this they are revolved until dry.



The Potthoff Plating Barrel.

Questions and Answers.

Question No. 734. I have sent you a sample casting of red metal that is used as a mouthpiece for cornets. This mouthpiece was not made by me and I have not only been unable to obtain a good casting mixture that will turn well, but I cannot produce the nice color on the surface of the casting itself.

Answer. For the cornet mouthpiece, a mixture that will turn well is needed. It must also cast well and be sufficiently hard to hold its shape while being machined. We suggest the following:

Copper	87 lbs.
Tin	7 lbs.
Zinc	3 lbs.
Lead	3 lbs.

If you find that the mixture is too hard, add less tin, but allow the other metals to remain the same. We suggest the use of new metals entirely if you desire a fine casting. The color on the surface is easily obtained by dumping the molds as soon as the castings have set, and then, while they are still hot, plunging them into clean, cold water. Dirty water or that which is hot, does not produce the desired color.

Question No. 735. I have just put in a new set of nickel anodes and they "throw sand" on the work. Can you tell me what causes them to do so? There is no mud on the bottom of the tank, and the anodes are all clean.

Answer. We should say from your description that your nickel deposit has been "burnt", as it would then become rough and have a sandy appearance, particularly on the edges. As your information is somewhat limited, we are unable to offer any additional suggestions. The remedy for "burnt" nickel work, of course, is to cut down your current. with a rheostat, or to hang more work in the solution. "Burnt" nickel is known by the black and rough appearance on the edges of the work. You can also reduce the strength of your solution by adding water and in this manner increase its conductivity so that less current will pass at a given voltage. It may be possible that your solution is too strong and that the addition of water will overcome your trouble. A nickel solution that stands from 5 to 7 degrees Beaumé is the best for general use.

Question No. 736. In making britannia-metal for rolling we have considerable trouble with air holes in the casting and also from the scaling of the sheet when rolled. This is particularly true when we melt scrap. How can it be overcome?

Answer. Soft metals, such as britannia-metal, pewter etc., when cast for rolling into sheet, should be poured at as low a heat as possible. Otherwise the bar will crack in the rolls. It is a mistaken idea that the heat of soft metals is not important. It is fully as essential in casting them as in the casting of brass or similar high melting metals. The scaling, as you call it, is undoubtedly caused by the cracking of the metal in rolling. The air holes may be caused by oil on your mold. It should be free from it and nothing used. In the use of scrap, it is preferable to melt and pour out into ingot molds, after carefully skimming, after which it is remelted for making the casting to be rolled.

Question No. 738. We are having trouble with our silver. When it is rolled, small blisters appear that spoil it for use. The ingredients used are as follows:

Granulated Silver	9.25 oz.
Copper Wire	.75 oz.

We melt it in a gasoline furnace in a sand crucible with a flux consisting of borax and sal-ammoniac with powdered, willow charcoal applied just before melting. The metal is poured as soon as the sal-ammoniac has burned off. A steel rod is used for stirring. The ingot appears sound, but upon rolling it shows blisters. We have the same difficulty in using scrap. If you can assist us it will be appreciated.

Answer. Your difficulty lies in the fact that you are overheating the silver. Place the copper in the bottom of the crucible, then add the silver and cover with charcoal. Use no sal-ammoniac or borax as it is unnecessary. As soon as melted and at the right heat for pouring, immediately pour into the mold. Do not allow it to remain in the fire any longer than is necessary nor to become too hot. Blisters are caused by gas absorption while melting, and too high a heat or allowing the metal to remain in the fire too long allow gas to be absorbed. Keep the metal well covered with charcoal when melted. Cut your copper in small pieces so that it will lie closely in the bottom of the crucible.

Question No. 740. We have some castings to make which must stand 4000 lbs. per sq. in. pressure. They are to be used for hydraulic work. This pressure, as you no doubt realize, is excessive and we desire the best mixture for the purpose. We take the liberty, therefore, of asking you for it.

Answer. The great difficulty in making castings to stand a high pressure is in obtaining sound castings. We are not believers in the idea that any particular mixture has a greater superiority over others for such work. Our experience has been that the casting is far more important than anything else. To be used, the mixture must be adapted for the purpose so that it will not be too soft or too brittle. Otherwise it appears to be a case of sound castings, and leakage, which is the difficulty encountered in making hydraulic castings, is usually the result of a flaw, visible or invisible, in the walls of the casting itself.

For ordinary work, such as pump cylinders or similar castings where hardness is essential, the following mixture is used by some pump companies: Copper, 84 lbs.; tin, 12 lbs.; zinc, 2 lbs.; lead, 2 lbs. If found too hard, add 10 lbs. of tin instead of 12 lbs. It is not advisable to use much less tin than 10 lbs. as the castings are then apt to be too soft for some classes of work and distortion under pressure may follow. For some castings, ordinary steam metal mixture is good. It is needless to say that castings for hydraulic work should be made as thick as possible.

QUESTION No. 741. Which is the better to use in a nickel solution for a conducting salt, sal-ammoniac (ammonium chloride) or common-salt (sodium chloride)? We have tried both, but have been unable to find any material difference.

Answer. Whether one has any advantage over the other has not been determined. Some platers use common-salt, while others employ sal-ammoniac. As far as we have been able to ascertain, the results are good with either. A careful series of experiments are necessary to determine the difference, if any.

QUESTION No. 742. Will you please advise me in regard to the mixture of a bronze medal, such as used in the equestrian statue on the Central Park Plaza, New York City?

Answer. The necessary qualities of a bronze metal for statues are:

1. Sound casting property.
2. Quality of filling the mold with the utmost sharpness.
3. Strength without brittleness.
4. Soft enough to permit chasing.

These qualities have been found by experience to be embodied in the following mixture:

Copper	90 lbs.
Tin	7 lbs.
Zinc	2 lbs.
Lead	1 lb.

In making statues, it is customary, among bronze founders, to use the best Lake or electrolytic copper obtainable and the purest Straits tin. So much labor is spent on the mold that economy in metal is never practiced.

QUESTION No. 743. My silver solution now stands 22 degrees Beaumé and it formerly was 15 degrees. When the work is put in 6 amperes turn the anodes black. What is the trouble?

Answer. Your silver solution is altogether too strong. It should not stand over 8 or 10 degrees. Add water to bring it down and you will then have no trouble. Your deposit will be good and the anodes will undoubtedly remain white, if they are of good quality.

QUESTION No. 744. What is the metal used for making coffin hardware and soft metal novelties? Is there any special mixture for the work and is it customary for manufacturers to mix their own metal?

Answer. The mixture almost exclusively used by the coffin hardware and soft metal novelty makers for their goods, consists of practically 87% of lead and 13% of antimony. This mixture has been found by experience to be best suited for the work. It runs in the mold well and is not brittle. It is also cheap. In some exceptional instances, when, for example, very thin castings are to be made, from 5 to 10 per-cent of tin is added in order to make the castings run; but as the tin adds to the cost considerably, it is not frequently used although an excellent metal. As large quantities of a lead and antimony alloy are obtained in silver smelting, it is sold on the market for a much less price than it is possible to make the mixture from the pure lead and antimony themselves. The new mixture, however, made from the best antimony and lead is really better than the so-called antimonial-lead obtained as a by-product, although not sufficiently superior to warrant the extra expense. The antimonial-lead of commerce answers all ordinary requirements for coffin hardware and soft metal goods.

QUESTION No. 745. Do you know of a good aluminum plating bath for electroplating iron and brass with aluminum? If so, kindly publish same and oblige.

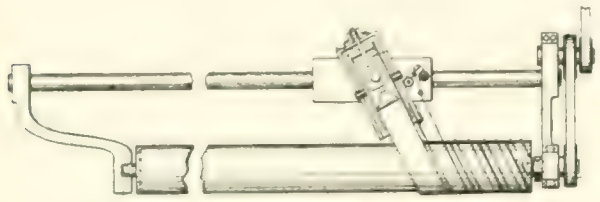
Answer. It is only recently that aluminum plating has been successfully accomplished and it cannot be called a commercial success. It is done by using a rotating cathode revolving at a high velocity—(from 15,000 to 20,000 revolutions per minute)—in a pasty solution of aluminum chloride and with an average current density of 2 amperes per sq. cm. at 15 volts. The deposit of aluminum was thin and dark colored and without value. The results thus obtained have no value except as demonstrating that aluminum can actually be deposited. For a description of the process, see THE BRASS WORLD, July 1909, page 233 "The Deposition of Aluminum from Aqueous Solutions".

QUESTION No. 747. What can be used as a brightener in nickel plating solutions? We understand that there is something that can be added for this purpose.

Answer. Both boracic acid and sal-ammoniac are used in nickel solutions for producing a so-called bright nickel deposit, but it must be borne in mind that such a deposit is not equal to a buffed one, and it can only be very light. Use about ⅛ oz. of boracic acid to the gallon (an excess seems to do no harm as it does not dissolve) and about 2 oz. of sal-ammoniac. The best effect of the solution is obtained when the nickel is deposited upon a perfectly clean polished surface so that only a mere film is obtained. It will then be bright, and a heavier deposit, of course, will become dull.

Patent Abstracts.

943,303, Dec. 14, 1909. MEANS FOR PREPARING CORE-BARS FOR THE CASTING OPERATIONS. Mordecai H. Fletcher of Cincinnati, Ohio. The inventor previously patented a method of using paper instead of

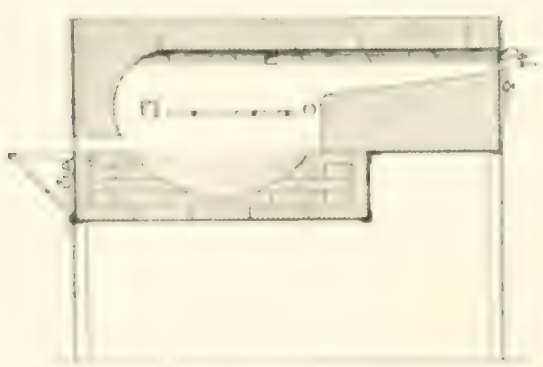


hay rope for winding around a core barrel previous to applying the loam, and this patent is upon a device for winding the paper automatically. The method may be understood by studying the sketch.

943,043, Dec. 14, 1909. BLOWPIPE. Eugene Odam of Paris, France. Assignor to the Societe'des Applications de L'Acetylene. The blowpipe differs from others heretofore made in that the gases are preheated in a chamber before mixing and burning, thus obtaining a higher temperature.

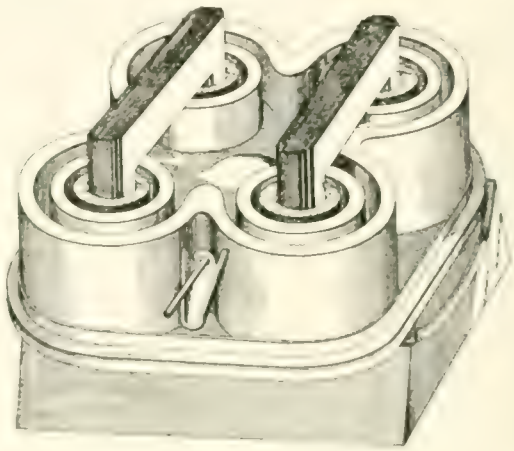
942,489, Dec. 7, 1909. METHOD OF MAKING WROUGHT ARTICLES. John H. Dods of Lawrence, Kansas. The object of this invention is to avoid the pipe in a cast billet of metal. The billet is rolled in such a manner that the pipe is contained in a central bar with two perfect bars each side. This bar containing the pipe is then rejected, leaving the two outside bars free from the imperfection.

941,609. Nov. 30, 1909. HEATING AND MELTING FURNACE. W. N. Best of New York City. The furnace is for melting metals without the use of crucibles. The construction of the furnace is the essential feature. It is



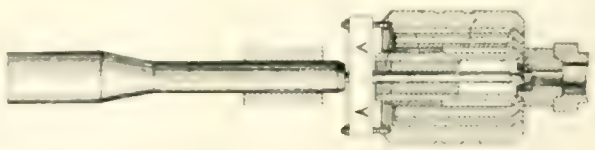
arranged so that the flame is deflected downwards in a large sheet to the metal to be melted or heated. The furnace is equally applicable to the heating of metals.

941,435, Nov. 30, 1909. INDUCTION FURNACE. Magnus Unger of Pittsfield, Mass. Assignor to the General Electric Co. This furnace is constructed with four cores and a central opening as shown in the illustration



so that comparatively large masses of metal may be inserted. This is a marked advantage over the ordinary type of induction furnace in which small masses of metal only are used.

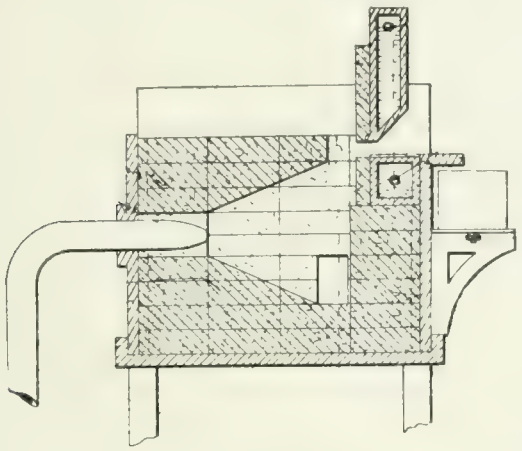
941,365, Nov. 30, 1909. MEANS FOR EXTRUDING HOLLOW BODIES. A. P. Hine, Assignor to the Coe Brass Mfg. Co., of Torrington, Conn. An improved extrusion machine for making tube shells of brass or copper. The novelty of the invention lies in the die. The billet used for extruding is



made hollow. The rear end of the mandrel is made with a powerful supporting bracket which serves to strengthen it. The die is made in a manner similar to that of a lead pipe machine so that the tube is formed hollow as it issues. The whole has been adapted for use with the hot metal to be extruded.

941,706, Nov. 30, 1909. BEDSTEAD-MOUNT BUFFING MACHINE. John F. Gail of Kenosha, Wis. Assignor to the Simmons Mfg. Co., of the same place. The machine is intended for the automatic buffing of articles used for the ornamentation of brass beds. The hollow brass mount is clamped between holding pieces or a rotary head stock, and is then moved into the field of a rotating buff-wheel upon which the polishing is done. The article is automatically released when the buffing is completed.

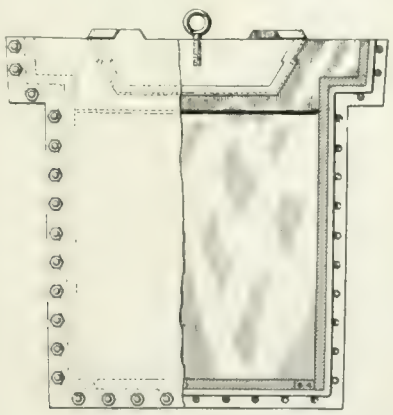
943,763, Dec. 21, 1909. FURNACE. Edwin Alls of Baltimore, Md. Assignor to The Monarch Engineering & Mfg. Co., of the same city. The furnace is intended for heating the ends of blanks from which bolts are made. The features of the furnace are the protection of



the operator when inserting and withdrawing the blanks. There is also an improvised table positioned at the opening to prevent the contact of the blanks during the withdrawing. The position of the fire brick is also a novelty.

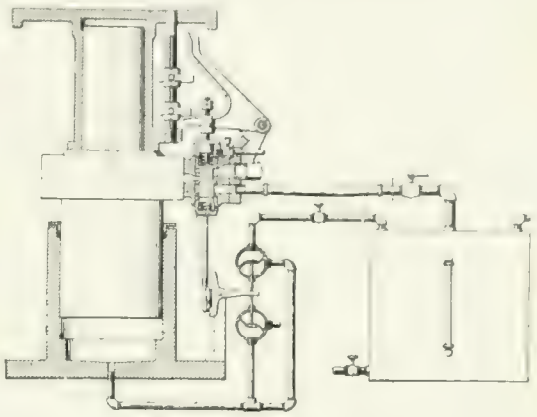
942,379, Dec. 7, 1909. METHOD OF MANUFACTURING DYNAMO-BRUSHES. George Egly of Berlin, Germany. Assignor to Gebrüder Siemens & Co., of Charlottenburg, Germany. Carbon is mixed with from 2 to 5 per-cent of silicon which increases the hardness and which polishes the commutator. It is said to give better results than carbon used alone.

941,796, Nov. 30, 1909. ANODE MOLD. John F. Miller of Trail, British Columbia. The mold is intended for casting copper or lead to be used in electrolytic refining. It may also be used for other metals of a sim-



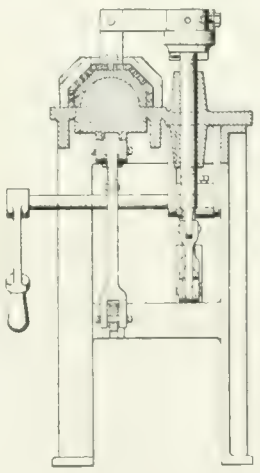
ilar nature. The mold is made of cast-iron, bolted together. When used, it is set in water to cool it. After casting, the top is removed by means of the eye-bolt and the anode may then be extracted.

941,999, Nov. 30, 1909. MOLDING MACHINE. Wilfred Lewis of Philadelphia, Pa. Assignor to the Tabor Mfg. Co., of the same place. This invention is upon a jarring machine. The machine has been so constructed that the jar or shock is not transmitted to the



floor but is absorbed by the machine itself. This is accomplished by means of a so-called "floating-anvil" which takes up the shock. It is possible, therefore, to place a large sized machine upon an ordinary floor without any special foundation.

942,073, Dec. 7, 1909. CASTING MACHINE. Frank H. Howard of Brookside, near Reading, Pa. A machine for the automatic casting of car bearings. The molds are



arranged on a turn table so that while one operator casts the bearing, another removes it from the mold after it has set.

941,835, Nov. 30, 1909. ALUMINUM SOLDER. John Worgovits of New York City. The solder consists of 70 parts tin, 20 parts zinc and 2 parts of copper.

943,164, Dec 14, 1909. WELDING COMPOUND. Max U. Schoop of Bois-Colombes, France. A flux for welding aluminum. It consists of 60 parts potassium chloride, 12 parts sodium chloride, 20 parts of lithium chloride and 6 parts of cryolite.

Trade Items.

C. J. Moberg, 201 North 6th. Ave., Mt. Vernon, N. Y., is now manufacturing die castings for the trade.

The addition which is being built to the plant of the Auburn Foundry at Auburn, Ind., will be used for the manufacture of brass, bronze and aluminum castings.

Plans are under way for the reorganization of the Middletown Silver Co., of Middletown, Conn., manufacturers of silver plated hollowware. This plant has been idle for some time.

The W. A. M. Mfg. Co., recently started to manufacture automobile accessories on West Exchange St., Providence, R. I., are now carrying on electroplating and polishing at their factory.

The Crescent Wire & Iron Works, Partridge & Sons, proprietors, of 62 King St., West, Toronto, Canada, have added an electroplating plant to their factory. Ornamental metal work is manufactured.

Milton Chase of 107 Main St., Haverhill, Mass., claims to have discovered a process of making aluminum from clay so that the cost will be reduced fifty per-cent. He has fitted up a smelting plant in the rear of his house.

The R. E. T. Pringle Co. Ltd., of Montreal, Canada, manufacturer of electrical apparatus, is now in liquidation. This company has been in existence for some time in the manufacture of electrical goods, and has also carried on electroplating and finishing.

Upon the application of the S. L. & G. H. Rogers Co., of Hartford, Conn., and the West Silver Co., of Taunton, Mann., Clarence F. Wessell has been appointed receiver for the Legate Mfg. Co., of Hartford, Conn., manufacturers of plated goods.

Wilkes & Anderson of Middletown, N. Y., manufacturers of the "Anderson" folding table are to start an electroplating plant at their works for plating the cast-iron table legs of their goods. Heretofore they have had the plating done by outside parties.

The Bayonne Casting Company, 13 West 9th St., Bayonne, N. J., are now making a specialty of casting Monel-Metal and are sending out to the trade a circular describing its uses and properties. They are making Monel-Metal castings which will pass Government specifications. In the pamphlet is contained [illegible] information regarding various physical properties of the metal.

The National Electroplaters' Association is to hold a dinner at the Hotel Marlborough, New York on January 15th. George B. Hogaboom of Newark, N. J., is the chairman of the committee and addresses will be made by Dr. Richard Moldenke of the American Foundrymen's Association, Dr. W. A. Jones of the Celluloid Zapon Co., S. D. Benohiel of the International Chemical Co., and Percy S. Brown of the Western Electric Co.

The Hayes Mfg. Co., of Erie, Pa., manufacturers of valves and plumbers' brass goods, are to establish a Canadian factory for the manufacture of the same line of goods.

According to U. S. Consul G. H. Scidmore of Kobe, Japan, a large copper company in Japan is to commence the manufacture of copper and brass tubing. Heretofore, none has been made in that country.

The Pullman Motor Car Co. of York, Pa., are to move their plant to Evansville, Ind., and will increase their manufacturing capacity to 1000 cars per year. It is expected that motor boats will also be manufactured.

The Dover Stamping & Mfg. Co., 385 Putnam Ave., Cambridge, Mass., manufacturers of tin ware, egg-beaters and other household hardware, are now carrying on copper plating and have fitted up a room for this purpose.

A large building has been purchased at Eastwood Park by the Munro-Eastwood Pen Co., recently organized in New Britain, Conn. Pens, stationers' supplies and hardware will be manufactured. Among the articles of hardware to be made will be a can opener.

The Frankfort Brass Mfg. Co., recently incorporated at Frankfort, Ind., will make brass, bronze and aluminum castings, and also do brass finishing. John A. Johnson is the president of the new company, and George A. Burges the superintendent.

A brass foundry is being started by the Jennings Bros. Mfg. Co., 219 Elm St., Bridgeport, Conn. This company are among the largest manufacturers of soft metal novelties in the United States, and are now about to enter the manufacture of solid brass and bronze goods.

The foundry of the Manitowoc Brass & Foundry Co., Manitowoc, Wis., was started on Dec. 16th. The foundry is located at 10th. and York Sts. Henry Stahl is the superintendent. The company is an outgrowth of the Manitowoc Iron & Metal Co., scrap metal dealers.

An explosion of gas in a drying oven at the works of the Dahlstrom Metallic Door Co., of Jamestown, N. Y., on Jan. 6th, killed an employee and injured several others. The oven was one used to bake the enamel or paint on the metallic doors which this company make. The factory was running overtime to fill orders and the explosion took place during the night.

The estate of the late Pierce N. Welch of New Haven, Conn., president of the Bristol Brass Co., of Bristol, Conn., and a director in many other large Connecticut metal manufacturing concerns, inventoried $1,160,,788. The principal holdings were in the New Haven Clock Co., and in the First National Bank of that city. Over $200,000 worth of stock in the clock company was held. His father was one of the founders of the clock company.

The Detroit Lubricator Co., of Detroit, Mich., are soon to erect a new brass foundry adjoining its present plant on Trumbull Ave.

The American Sanitary Mfg. Co., of Detroit, Mich., manufacturers of plumbers' brass goods, are to move to Abington, Ill., where a new plant will be erected.

The Atlantic Plating Works has been organized in Atlantic City, N. J., by Geo. B. Stoddard and W. A. Gardner. They are located at 716 North Indiana Ave.

The Western Stove Mfg. Co., of Portland, Oregon, is to build a plant at Calgary (Alberta) Canada, for the manufacture of stoves for the Canadian trade.

The Elkhart Hardware Mfg. Co., has been incorporated at Elkhart, Ind., and will manufacture piano hardware. The incorporators are S. E. Schacht, J. G. Schacht, and F. T. Maloney and the capital stock is $10,000.

The Riley-Klotz Company of Newark, N. J., have taken the factory at 18 Mulberry St., to continue manufacturing until their old shop, recently destroyed by fire, is rebuilt. They manufacture metal novelties.

The Duplex Roller Bushing Co., of Belfast, Maine which recently went into a receiver's hands, was purchased at the receiver's sale by H. Holton Wood of Boston, Mass. He was the only bidder. This company manufactured roller bushings, tackle blocks and marine hardware. They also operated a brass foundry.

The Doehler Die Castings Co., Court & Ninth Sts., Brooklyn, N. Y., are now producing some excellent examples of die castings finished ready for use. These castings require no machine work upon them as they are as accurate as machine work could make them. Many uses have been found for these die castings, and in a large number of instances they can be used to replace more expensive machined brass castings.

The Westport Brass Foundry has been organized at Westport, Conn., to make brass, bronze and composition castings. A specialty will also be made of propeller wheels and a fine grade of wood and metal pattern work will be done. Business has already been started and goods are now being turned out. The foundry is in the factory formerly occupied by the Doscher Plane Co., between Westport and Saugatuck.

At a recent meeting of the National Association of Brass Manufacturers of the United States, an organization composed of the plumbers' brass goods manufacturers, the following officers were elected: President, Theodore Ahrens of Louisville, Ky.; Trustees, A. S. Hills, Haydenville, Mass.; D. H. Roberts, Detroit, Mich.; C. C. Hale, New Haven, Conn.; W. H. Wasweyler, Milwaukee, Wis.; F. Somerville, Toronto, Canada; J. W. Sharpe, Jr., Philadelphia, Pa.; Theodore Ahrens, Louisville, Ky. Delegates: J. J. Ryan, Chicago, Ill. and C. K. Sanborn, New York City.

The Standard Supply & Mfg. Co., has been organized at Hutchinson, Kansas to manufacture metallic packing.

The Dayton Computing Scale Co. of Dayton, Ohio, are to build a new factory to replace the one destroyed by fire and are to operate it by motors.

The plant formerly occupied by the W. H. Rogers Silver Plate Co., at Plainfield, N. J., manufacturers of silver plated ware, and who moved to Muncie, Ind., has been sold to the Somerset Mills of Patterson, N. J.

The plant of the Monitor Stove & Range Co., of Cincinnati, Ohio, manufacturers of stoves and ranges, will shortly be greatly enlarged. The nickel plating department is to be increased and a new addition will be built for it.

The plant of the Lancaster Silver Plate Co., at Lancaster, Pa., was recently purchased at the receiver's sale by H. M. Musser, the well known manufacturer of gold and silver novelties of that city, for $12,500. The molds and unfinished work brought $1,600. The property will be occupied by the purchaser.

The manufacturers of calcium carbide in Sweden, Norway, Germany and England, have formed an association or "trust" for the production of this material. Two main offices will be established. One will be at London, England and the other at Nuremberg, Germany. The capacity of the Norwegian plants alone is over 100,000 tons per year.

The Racine Foundry Co., was recently incorporated in Racine, Wis., to manufacture brass, aluminum and iron castings for the automobile trade. Manufacturing will shortly be commenced in a factory already built, and later a foundry 60 x 125 feet will be constructed. In addition, a machine and boiler shop will be built.

The Gorham Mfg. Co., of Providence, R. I., manufacturers of sterling-silver ware, have brought suit against F. & M. Weintraub, 403 Broome St., New York City, alleging infringement upon their trade mark. The complainants claim that inferior quality of goods have been made by F. & M. Weintraub, and that they have placed their trade-mark upon them. The defendants, F. & M. Weintraub, claim that they have made Sheffeld plate and have made no claim that it was solid silver. They state that they will fight the suit.

R. F. Lang, 31-33 Broadway, New York City, importer of alloys, recently spent some time abroad, and reports that the works which produce the "Royal" brand of alloys are pushed to their full capacity. They have large contracts with the Krupp Works at Essen for manganese-copper, the Imperial Navy Yard at Kiel and many of the large shipbuilding concerns. Royal phosphor-copper has found a large use in the United States for making phosphor alloys and the demand is constantly increasing. A booklet is issued on the various products sold which will be sent to those who desire it.

The Connecticut Mfg. Co., has been incorporated at Waterbury, Conn., with a capital stock of $25,000 to manufacture small metal goods. The incorporators are C. H. Swenson, John Swenson and A. H. Osborne of that city.

P. H. Bonvillian and E. Ronceray of Paris, France, the well known manufacturers of molding machines, have decided to handle the American trade themselves and are now represented by E. Espana, 36th and Chestnut Sts., Philadelphia.

The Birmingham Mfg. Co., has been incorporated in Birmingham, Ala., to manufacture plumbers' brass goods, iron pumps and similar goods. A shop 60 x 100 feet is to be built. James Gibbons is the president; R. C. Rufus, vice-president; and J. L. Travis, sevretary and treasurer.

A new plant is to be established in North Haven, Conn., by the New Haven Electric Co., recently organized. Electric switches and electric specialties are to be made. The capital stock is $5,000 and John Fruin is the president; Wm. R. Hoyt, vice-president; and Henry C. Barber the secretary and treasurer.

The Mumford Molding Machine Co., has been organized to take over the business formerly conducted by the E. H. Mumford Co., 12223-1225 Spring St., Philadelphia, Pa., and will sell the Mumford molding machines. The machines will be made for the company by the Q. M. S. Co., of Plainfield, N. J. The sales office of the company will be at 30 Church St., New York City. W. D. Sargent is the president of the new company and E. H. Mumford vice-president and general-manager.

Robinson, "The Plater" of Chicago, Ill., has purchased the business of the Sercomb Co., of that city and united it with his own. J. E. Robinson has conducted a job plating business in Chicago for the past 30 years under the above name. This combination has enabled him to greatly increase his facilities for plating, and he is now able to take care of work of any kind in the largest quantities. Two establishments are now maintained: One at Wabash Ave. and 14th St., and the other at Van Buren and Canal Sts.

The Hanson & Van Winkle Co., of Newark, N. J., are sending out the following circular in reference to their electrogalvanizing suit. On June 8th, 1908, Judge Cross of the Circuit Court, rendered a verdict in favor of our company in the suit of the U. S. Electrogalvanizing Company against us, claiming infringement on the solution and process. The essential feature of the decision was 'that the defendant's bath is not the bath of the patent, nor is it any one of the baths, nor is it the bath of any one of the claims. The defendant's bath is not prepared the same way as the bath of the patent in suit. The bill was accordingly dismissed with cost. An appeal was taken by the United States Galvanizing Co., and a recent decision of Judge Gray, affirms the decision of the lower court in all respects."

The Hoosier Auto Co. has been incorporated at Garrett, Ind., to manufacture automobiles. The capital stock is $80,000.

Frederick B. Weiss, Inc., has been organized at Newark, N. J., with a capital stock of $25,000 to take over the business of the Schwartzkopf Mfg. Co., 473 Washington St., manufacturers of 10 karat jewelry.

The King Sewing Machine Co., of Buffalo, N. Y., have acquired eight acres of land on Railroad St., Buffalo, N. Y., and will erect a plant to cost $150,000. A foundry will also be erected. The present address of the company is at 254 Court St.

Handy & Harman of Bridgeport, Conn., manufacturers of sterling-silver sheet and fine silver anodes, and also sweep smelters and gold and silver refiners, have mailed to their customers the customary pocket memorandum book which has been found so useful.

Robert J. Taylor, Inc., 19th. and Callowhill St., Philadelphia, Pa., manufacturers of plumbago crucibles and a large variety of other plumbago products, are sending to the trade a calendar of the same kind that they have presented to their customers for a long time and which has proved so useful and handy.

Leiman Bros., 62 John St., New York City, have been making sand blasts for so long a time that they have followed the needs of the trade minutely. The result is that the sand-blast which they make is particularly adapted for sand-blasting the large variety of metal goods found in the metal trade. Their blasts are self feeding so that once charged, they require no attention. They also manufacture blowers and vacuum pumps. When in the market for sand-blasts, they should be allowed to figure on the requirements. They have never failed to satisfy the trade.

Those interested in electric cleaners should write to the Cleveland Platers Supply Co., 1838 Central Ave., Cleveland, Ohio, who make the "Electric" cleaning compound and issue a booklet entitlel "Cleaning by Electricity." This compound was offered to the trade on Aug. 1st, 1907 and on Nov. 1st, 1909, 431 customers had been obtained which speaks for its value. The value of electric cleaners is rapidly being appreciated, and those who have not used them should write for the booklet. The cleaning of work for plating is greatly simplified by their use and rendered more thorough.

Attention is called to the fact that The S. Obermayer Company of Cincinnati, Ohio, the well known manufacturers of foundry supplies, are now placing upon the market their "Esso" copper chaplet for use in casting aluminum, brass and bronze. This chaplet is made perforated so that the metal runs around it and firmly holds it in place. In instances in which it is necessary to use a chaplet, and in many cases they must be used to hold a core in place, the "Esso" copper chaplet will be found just what has been needed. There is no danger of its melting and allowing the core to fall

The Gould Balance Valve Co., is building a new plant at Des Moines, Iowa.

The McIntyre Watch Co., has been incorporated at Kankakee, Ill., with a capital stock of $500,000 to manufacture watches.

The Courtright Stove Co. Ltd., has been incorporated at Courtright, Ont., Canada, with a capital stock of $40,000 and will manufacture stoves.

The Liquid Carbonic Co., of Chicago, Ill., manufacturers of soda fountains and accessories, have commenced the erection of a new plant which, it is said will be the largest in the United States.

The new plant for the manufacture of solder has been completed by the Pacific Metal Works, at Park and Everett Sts., Portland, Oregon. The plant is equipped with four furnaces and also contains storage facilities for copper, tin, zinc and lead which the company handle as jobbers.

The Waterbury Crucible Co., of Waterbury, Conn., the well known manufacturers of graphite crucibles and graphite products, are mailing to their customers a unique and artistic calendar. The calendar is illustrated with a vivid picture of the trade mark of the company and which has been so much admired.

Work on the new factory of the Whiting Mfg. Co., at Bridgeport, Conn., is rapidly nearing completion, and when finished it will be one of the most complete and extensive in the city. This company is one of the largest manufacturers of sterling-silver ware in the United States and it is expected that some 500 hands will be employed.

The Roessler & Hasslacher Chemical Co., 100 William St., New York City, manufacturers of a large variety of special alloys, chemicals, and platinum wares, are sending out to the trade an extremely artistic calendar. The calendar is illustrated with a photogravure picture of a rolling mill reproduced from a painting. At the side is given a list of the chemical elements and their atomic weights.

The Union Brass Works, recently incorporated in Detroit, Mich., with a capital stock of $30,000, is erecting a plant on Rivard St., and Harper Ave. The brass foundry is to be 32 x 70 feet and the two story main building 42 x 96 feet. A general line of valves, gas and water fittings, and automobile brass goods is to be manufactured and it is expected that manufacturing will shortly be commenced.

The condition of business at the Ellwood Ivins Tube Works at Oak Lane Station, Philadelphia, Pa., indicates that prosperity is actually here. They report that they are five months behind in their orders and are adding more furnaces and machinery. They are now operating 42 draw benches, 2 sets of 18 inch rolls, and 5 furnaces. Tubing up to 4 inches outside diameter is now made in both tool and open-hearth steel. Large orders for tubing were recently filled by them for the Government and for a Japanese customer.

The Nassau Smelting & Refining Works, New York City, B. Lowenstein, Proprietor, make ingot copper, pig lead and tin, spelter, yellow and red brass ingot, manganese-bronze ingot, babbitt-metal, solders, linotype and electrotype metals for the trade. When in the market for these metals, prices should be obtained from them. They are also headquarters for aluminum and nickel.

Chas. F. L'Hommedieu & Sons, Co., 24 South Clinton St., Chicago, Ill., are manufacturers of the "Reliance" polishing wheels. These are made in considerable variety in canvas, bull-neck, wood, sheepskin, cotton and walrus wheels. If any of these wheels are used in polishing, the "Reliance" wheel should be tried. They will be found capable of doing a large amount of work of a fine quality. The wheels are all made in their own shop.

The Hill & Griffith Co., of Cincinnati, Ohio, and Birmingham, Ala., the well known manufacturers of foundry supplies, are manufacturing "Brassco", a dry core compound intended particularly for use in making dry sand cores for brass, bronze and aluminum castings. It has been thoroughly tested, and has been found superior to flour, oil, rosin or other materials frequently used for the purpose. It generates no gases and is a quick dryer. Cores made with "Brassco" will not swell or absorb moisture. One part of "Brassco" will bind from 40 to 50 parts of sand. Every founder who desires to improve his cores should give it a trial.

Personal.

At a recent meeting of the directors of the Joseph Dixon Crucible Co., of Jersey City, N. J., J. H. Schemerhorn was elected assistant secretary and treasurer of the company.

Charles J. Caley, formerly general-manager of the Russell & Erwin Mfg. Co., of New Britain, Conn., has become associated with the Peterboro Lock Co., of Peterboro, Canada, in the capacity of works manager.

George W. Hayden has been made superintendent and general manager of the Pratt & Cady Co., of Hartford, Conn., manufacturers of steam goods. Mr. Hayden was recently works manager of the McNab & Harlan Mfg. Co., of Patterson, N. J., and for nineteen years was connected with the Crane Co., of Chicago.

J. W. Coyle, who was formerly connected with the Best Calorific Co., has now become associated with the Rockwell Furnace Co., 26 Cortlandt St., New York City, and will make a specialty of oil and gas furnaces for railroad work. Mr. Coyle has had much experience in railroad work and was formerly master-blacksmith for the Lehigh R. R., at Wilkesbarre, Pa., and later was in charge of the forge shops of the P. & R. R. R., at Reading, Pa.

Current Metal and Supply Prices.

These Prices are net and are for moderate quantities. Smaller quantities command higher prices. Prices subject to fluctuation.

Acetone, pure, 98-99%	lb.	.22
Acid, Acetic, pure, 30%	lb.	.07
Acid, Arsenious (White Arsenic)	lb.	.20
Acid, Benzoic	lb.	.55
Acid, Boracic (Boric), pure	lb.	.12
Acid, Hydrochloric, see Acid, Muriatic.		
Acid, Hydrofluoric, 30%	lb.	.04
Acid, Hydrofluoric, 50%	lb.	.10
Acid, Muriatic, 20°	lb.	.02
Acid, Muriatic, c. p., 20°	lb.	.07
Acid, Nitric, 38°	lb.	.05⅝
Acid, Nitric, 40°	lb.	.05⅞
Acid, Nitric, 42°	lb.	.06¼
Acid, Nitric, c. p.,	lb.	.08
Acid, Sulphuric, 66°	lb.	.01¾
Acid, Sulphuric, c. p.	lb.	.06
Alcohol, Wood	gal.	.50
Alcohol, Denatured	gal.	.55
Alum	lb.	.04
Aluminum, Sulphate	lb.	.06
Aluminum, Metallic, in Ingots	lb.	.23
Aqua-Fortis, see Acid, Nitric.		
Ammonia Water (Aqua-Ammonia), 20°	lb.	.04¾
Ammonia Water (Aqua-Ammonia), 26°	lb.	.06¼
Ammonia Water, c. p.	lb.	.08
Ammonium Carbonate, lump	lb.	.15
Ammonium Chloride (Sal-Ammoniac)	lb.	.12
Ammonium Hydrosulphuret	lb.	.30
Ammonium Sulphate	lb.	.07
Ammonium Suphocyanate	lb.	.50
Amyl Acetate	gal.	1.85
Antimony	lb.	.08½
Arsenic, Metallic	lb.	.15
Arsenic, White (Acid Arsenious)	lb.	.20
Argols, White (Cream of Tartar)	lb.	.31
Asphaltum, Commercial	lb.	.05
Asphaltum, Egyptian (Bitumen)	lb.	.30
Benzine	gal.	.15
Benzol, Pure	gal.	.75
Bismuth, Metallic	lb.	1.75
Bitumen, see Asphaltum.		
Blue-Vitriol, see Copper Sulphate.		
Borax, Crystals or Powdered	lb.	.10
Borax Glass	lb.	.35
Cadmium, Metallic	lb.	.70
Carbon Bisulphide	lb.	.10
Calcium Carbonate (Precipitated Chalk)	lb	.10
Chrome-Green	lb.	.50
Copper, Lake, (carload)	lb.	.14
Copper, Lake (cask)	lb.	.14¼
Copper, Electrolytic (carload)	lb.	.13¾
Copper, Electrolytic (cask)	lb.	.14
Copper, Casting (carload)	lb.	.13⅝
Copper, Casting (cask)	lb.	.13⅞
Copper Acetate (Verdigris)	lb.	.35
Copper Carbonate, dry	lb.	.25
Copper Sulphate (Blue-Stone)	lb.	.09
Copperas, see Iron Sulphate.		
Corrosive Sublimate, see Mercury Bichloride.		
Cream-Tartar, see Potassium Bitartarate.		
Cryolite	lb.	.12
Cyanide, see Potassium Cyanide.		
Dextrin	lb.	.15
Emery Flour	lb.	.04
Emery, F F & F F F	lb.	.03
Flint, powdered	lb.	.01
Fluor-Spar	lb.	.01¼
Fusel-Oil	gal.	1.75
Gold Chloride	dwt.	.60
Gum Copal	lb.	.30
Gum Guiacum	lb.	.26
Gum Mastic	lb.	.70
Gum Sandarac	lb.	.35
Gum Shellac, brown	lb.	.50
Gum Shellac, white	lb.	.60
Iron Perchloride	lb.	.25
Iron Sulphate (Copperas)	lb.	.05
Lead Acetate (Sugar of Lead)	lb.	.15
Lead, Pig	lb.	.04¾
Lead, Red	lb.	.12
Lead, Yellow Oxide (Litharge)	lb.	.12
Liver of Sulphur, see Potassium Sulphide.		
Manganese, Ferro, 80%	lb.	.10
Manganese, Metallic, pure	lb.	.75
Magnesium, Metallic	lb.	1.50
Mercury Bichloride (Corrosive Sublimate)	lb.	.93
Mercury, Metallic (Quicksilver)	lb.	.89
Mercury Nitrate	lb.	1.50
Mercury Oxide, yellow	lb.	1.80
Nickel and Ammonium Sulphate (Double Salts)	lb.	.16
Nickel Carbonate, dry	lb.	.60
Nickel Chloride	lb.	.50
Nickel Metallic	lb.	.40
Nickel Sulphate (Single Salts)	lb.	.25
Nitre (Saltpetre), see Potassium Nitrate.		
Oil of Vitriol, see Acid, Sulphuric.		
Paraffine	lb.	.15
Phosphorus, yellow	lb.	.40
Phosphorus, red	lb.	1.10
Pitch	lb.	.05
Plaster of Paris, Dental	bbl.	4.00
Platinum Chloride	oz.	14.50
Platinum Metallic	oz.	33.25
Potash-by-Alcohol, in sticks	lb.	.50
Potash, Caustic (Potassium Hydrate)	lb.	.08
Potassium Bichromate	lb.	.14
Potassium Bitartarate (Cream of Tartar)	lb.	.31
Potassium Carbonate (Pearlash)	lb.	.10
Potassium Chlorate	lb.	.15
Potassium Cyanide	lb.	.25
Potassium Iodide	lb.	2.25
Potassium Nitrate (Nitre or Saltpetre)	lb.	.10
Potassium Permanganate	lb.	.17
Potassium, Red Prussiate	lb.	.60
Potassium, Yellow Prussiate	lb.	.24
Potassium Sulphide (Liver of Sulphur)	lb.	.15
Potassium Sulphuret, see Potassium Sulphide.		
Potassium Sulphocyanate	lb.	.70
Pumice, Ground	lb.	.05
Quartz, Powdered	lb.	.01
Rosin, Yellow	lb.	.04
Sal-Ammoniac, see Ammonium Chloride.		
Sal-Soda, see Sodium Carbonate.		
Silver Chloride, dry	oz.	.75
Silver Cyanide	oz.	1.00
Silver, Fine	oz.	.52⅝
Silver Nitrate, crystals	oz.	.50
Soda-Ash	lb.	.05
Sodium Biborate, see Borax.		
Sodium Bisulphite	lb.	.15
Sodium Carbonate (Sal-Soda), crystals	lb.	.02
Sodium Hydrate (Caustic Soda)	lb.	.05
Sodium Hydrate (Caustic Soda) by Alcohol (in sticks)	lb.	.45
Sodium Hyposulphite ("Hypo")	lb.	.04
Sodium Metallic	lb.	.90
Sodium Nitrate	lb.	.05
Sodium Phosphate	lb.	.09
Sodium Silicate (Water-Glass)	lb.	.04
Soot, Calcined	lb.	.15
Spelter, see Zinc.		
Sugar of Lead, see Lead Acetate.		
Sulphur (Brimstone), in lump	lb.	.05
Tin Chloride	lb.	.43
Tin, Metallic	lb.	.33½
Turpentine, Venice	lb.	.35
Verdigris, see Copper Acetate.		
Water, Distilled	gal.	.15
Water-Glass, see Sodium Silicate.		
Wax, Beeswax, yellow	lb.	.45
Wax, Carnauba	lb.	.70
Whiting (Ground Chalk)	lb.	.02
Zinc Carbonate, dry	lb.	.19
Zinc Chloride	lb.	.12
Zinc, Sulphate	lb.	.06
Zinc (spelter)	lb.	.06⅜

THE BRASS WORLD AND PLATERS' GUIDE

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Manganese-Bronze Difficulties.

After having made considerable investigation of the various difficulties encountered in the casting of manganese-bronze in sand, we have come to the conclusion that over-heating, more than any other one thing, is the main error made by the average brass founder. It requires more skill to make a good manganese-bronze casting than it does to produce a satisfactory one of tin bronze. The melting, the pouring, the gating and the molding all require particular attention and a knowledge of the properties of the metal before good castings can be made. The melting, however, more than any other part of the successful operation, needs more than ordinary attention

In the first place, manganese-bronze contains nearly twice as much zinc as ordinary brass, and it also melts at a much lower temperature. A melter who is accustomed to melt ordinary brass for sand castings or composition, usually errs in his judgment of the melting point of manganese-bronze. He places it in the crucible and the melting begins. Accustomed to the other metals, he pays little attention to it for some time, when, upon removing the furnace cover, he finds that zinc oxide is being given off in large quantities. In order to offset this, he puts more metal in the crucible until the temperature is lowered. The evolution of the zinc oxide ceases and he may have to await the completion of a mold before the crucible can be poured. In order to take care of this diffi-

culty, the cover of the furnace is removed and the crucible is allowed to remain in the fire and "simmer" until the mold is ready. The metal is again cooled by gates or other forms of scrap, and when the right heat is obtained the crucible of molten metal is poured into the mold.

The problem is now resolved into one simple question: Is manganese-bronze that has been overheated and cooled to the right pouring temperature capable of producing as good castings as that which has been allowed to melt and arrive at the desired heat for pouring, and without any necessity for cooling down? No! it is not. During the overheating the bronze is injured and the cooling down will not bring it back to its original condition, even though the pouring temperature may be right. The castings will be dirtier, contain blowholes and will be more apt to crack. In addition, of course, there is the loss of spelter, but this influences only the strength of the bronze. The absorption of gases and the oxidation of the metals in the bronze seem to be responsible for the deterioration of the manganese-bronze when overheated, and the only solution of the problem seems to be to allow it to become no hotter in the fire than is actually needed for pouring.

Anode Surface.

It is quite common for platers to err in the use of too small a number of anodes particularly in the case of nickel solutions in which a greater anode surface is necessary than in any other in common use. The economy is followed simply on the score of cost, but it is false economy as the metal deposited must come from some source, and if it does not come from the anodes, the solution is robbed.

In the case of a nickel solution, the anodes do not give up their metal freely and as much surface as possible must be employed. Theoretically, were there no secondary reactions, an anode surface equal to that of the cathode would be all that is required, and in the case of silver this proportion answers. With nickel, however, it is not true, and there is always a certain amount of passive surface exposed, that which is inert, and that which has become coated with a deposit which masks the reaction, so that a large excess of surface is required. Let it be said that too much anode surface cannot be obtained in a nickel solution, and those who are successful in maintaining it see that there is an ample number of anodes.

With too few anodes, the nickel is not given off from them as fast as it is deposited; but, instead, the nickel is robbed from the solution and free sulphuric acid left. The balance is thus disturbed and sooner or later, unless remedied, the bath goes wrong. In addition, it is expensive practice for the reason that the nickel in the anodes is far less expensive than that in the double or single nickel salts.

Fusel Oil in Germany.

Vice-Consul W. Washington Brunswick, of Chemnitz, furnishes the following information concerning the manufacture of fusel oils in Germany.

Fusel oils are by-products of the alcoholic fermentation, which are found, especially in the manufacture of brandy from potatoes, for the most part as an oleaginous liquid, swimming on the surface of the distilling apparatus, being the residuum in the process of the rectification of spirits.

The chief elements of the fusel oils obtained from potatoes are amyl alcohol, besides various esters, furfurol, etc. Amyl alcohol is the principal component of fusel oils. In the manufacture of amyl alcohol, crude potato fusel oil is shaken with water, which contains a slight addition of alcohol, in order to remove the ethyl alcohol; then the fusel oil, forming the upper layer, is drawn off, freed from water with calcium chloride, and distilled in a sand bath. The remaining parts, which begin to ferment at a temperature between 266° and 275° F., are then collected and again rectified.

Amyl alcohol is used in the manufacture of fruit ethers, nitrous ether of amyl valerianic acid, various aniline colors, etc. It is also used for lighting purposes and for manufacturing, cleaning, and the detection of many alkaloids. In Germany, where it is very extensively manufactured, the prices vary according to the degree of purity, usually being from 180 to 290 marks per kilos ($42.84 to $69.02 per 220 pounds).

Vanadium-Bronze in Marine Construction.

Vanadium is one of the most interesting of the rare metals that have made their way into commercial world within the past few years. In steel, it has given remarkable results and its effect seems to be toughen it without decreasing its elastic limit, and to produce an "anti-fatiguing" quality so that it will withstand a shock in a wonderful manner. Vanadium also has a strong deoxidizing property, unites with nitrogen readily and removes it from the metal to which it is added, and at the same time, an excess imparts special properties. By the use of vanadium, therefore, peculiar effects have been obtained in special steels that appear to have been impossible with elements other than vanadium.

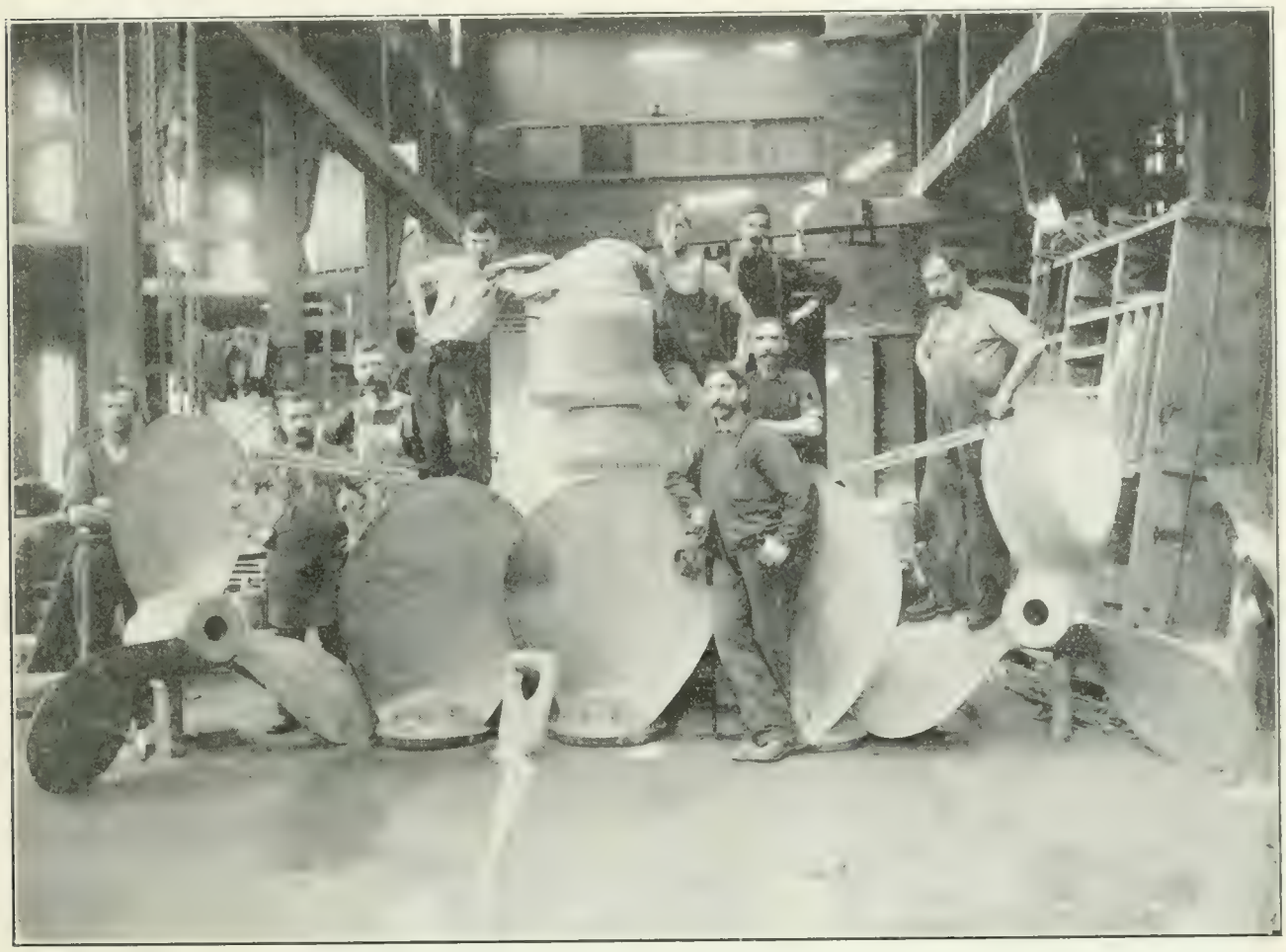


Fig. 1. Castings of Propellers and Other Marine Work, Made of Vanadium-Bronze and Cast at the Foundry of the Vanadium Metals Co., East Braintree, Mass.

Vanadium itself is usually considered a rare element, although it is more widely distributed than generally imagined. It can scarcely be called a common element, however, and perhaps it would be better to say that it is one of the more common of the rare elements. The principal source of vanadium at the present time is in Peru where it exists in the form of sulphide. It is mined there and transported to Callao from whence it is shipped to Pittsburgh for refining and reduction to the metal. Strange to say, vanadium is quite a common ingredient in caustic soda which frequently contains as much as 0.004%. An amount quite small in one sense, but large in another when it is considered that it is an impurity and a rare element. As soap is made from caustic soda, one writer has made the statement that practically all common soap contains vanadium.

Vanadium was discovered over a hundred years ago, and it is only with the past few years that any commercial use has been made of it. It is a silvery white metal of a specific gravity of 5.6. It is, therefore, lighter than zinc or copper, but heavier than aluminum. It is really about half way between zinc and aluminum. Its melting point is quite high,

and according to an authority, it is in the neighborhood of 3600 degrees F. It is much higher than the melting point of platinum or steel.

In the smelting of vanadium from its ores, the pure metal is not produced, but an alloy with other metals. If iron is used in the smelting, ferro-vanadium is produced. With copper, a cupro-vanadium is obtained and this alloy is what is used in the manufacture of vanadium-bronze. By first alloying the vanadium with the copper, an alloy with a comparatively low melting point is obtained so that it melts readily and may be easily introduced into the common bronzes.

The first concern to take up the making of vanadium-bronzes in the United States, seems to be the Victor Metals Co., of East Braintree, Mass., to whom we are indebted for the photographs of the castings herewith shown. This plant has recently passed into the control of the Vanadium Metals Co., of Pittsburgh, Pa., who will use it for the making of vanadium-bronzes for the trade. To the superintendent of the plant, Victor Lassen, belongs the credit of first producing commercial vanadium-bronzes in a successful manner.

The bronze made by them for use in marine-work resembles manganese-bronze in appearance and, like it, also contains considerable zinc and a small quantity of aluminum for imparting good casting qualities to the mixture. A small quantity of vanadium is also used and to this, it is claimed, the superior qualities of the bronze are due. Various grades of the vanadium-bronze are made, depending upon their use. It may be rolled hot, forged, or cast in sand. The mixtures, however, must be changed in each case to adapt it for the different purposes.

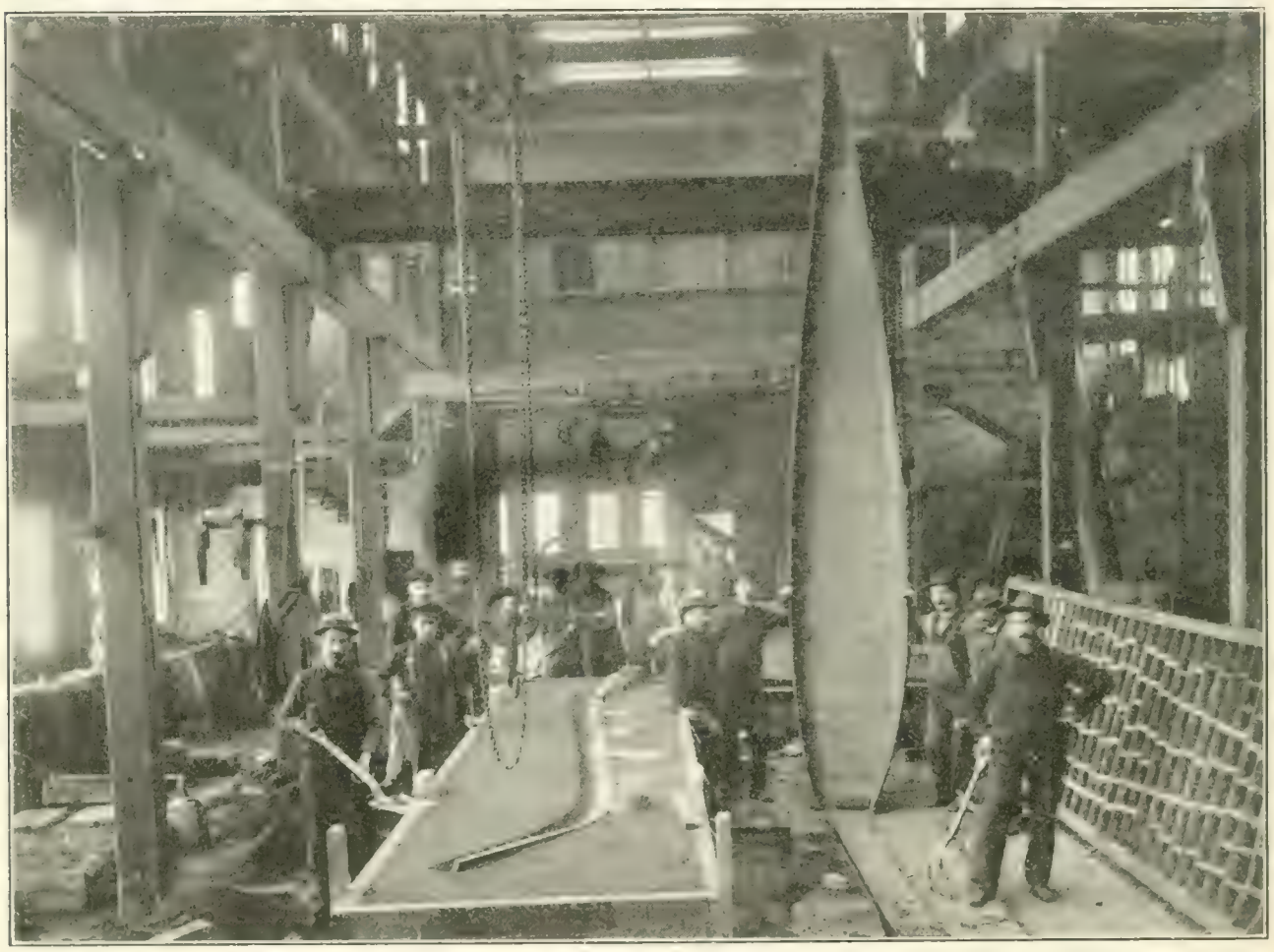


Fig. 2. Interior of Foundry of the Vanadium Metals Co. at East Braintree, Mass.

In Figs. 1 and 2 are shown some large castings made of vanadium-bronze. They were made at the plant of the Vanadium Metals Co. at East Braintreee, Mass., for the Government, and indicate the quality of the work that may be turned out. The high elastic limit of the bronze with the great elongation and reduction of area, seem to fit it particularly for Government work of the kind illustrated.

The Future of Electroplating from the Electrochemists' View.*

By Percy S. Brown.§

There seems to be a general impression among platers that the chemist is merely a theorist and they are inclined to smile whenever he attempts to show them some points about plating. This attitude is an unadvised one as the modern chemist is, as a rule, a specialist and when he becomes interested in plating it is only a matter of a short time before he learns the practical points and becomes equipped to more than compete with the experienced plater.

Electroplating is essentially a chemical, or more correctly an electrochemical process, and, therefore, it is far easier for a chemist who knows the theory of electrolytic action to learn the practice of plating than for the practical plater to learn the theoretical. Eventually the plater will also be a chemist as a matter of self-protection, as otherwise he will find himself being replaced by the younger generation. If you make inquiries among foremen platers you will find that they are awakening to this fact and are looking into the question of taking up the study of chemistry either in night schools or by correspondence.

If we give credit where credit is due we will find that the greatest advances in electroplating have been made through the published researches of chemists and metallurgists or platers well versed in chemistry. Such names as Classen, Sang, Cowper-Coles, Watts, Langbein and others should be well known by every plater through their researches in electroplating and similar lines. The improvements in the art of electrodeposition have been so gradual that we are inclined to feel that it is but the natural outcome of a progressive age and not due to the careful work of a few able men. Unquestionably our progressive platers' supply houses have been instrumental in bringing about improvements; but many of these improvements are the result of years of work by chemists and metallurgists either directly in their employ or whose patents and investigations have been considered of sufficient monetary value to receive their financial backing. In the same way the competition between the various supply houses has been a direct means of benefiting the plater, as this competition has caused great improvement in the quality and variety of the various materials used in plating and has aided in the development of new methods and processes. In all of these improvements you will find that the chemists had an active part and it is certain that the more closely the chemist becomes associated with the supply houses the more improvements will be made.

As an example of how a knowledge of chemistry will benefit the plater, I know of cases where materials are sold under fancy names and when analyzed are found to be commercial material that can be purchased on the open market 100% cheaper than they can be purchased from the supply houses. This is no exaggeration but an absolute fact, although fortunately it is a severe case and one not occurring very commonly. The fact that platers' supply houses are not immune from taking large profits for commercial material sold under fancy names makes it all the more necessary that the plater should be able to determine the quality of the material that he is buying. The plater who can demonstrate to his employers how he can save them money by his knowledge of chemistry will soon be pushing the so-called practical old-time plater to the wall.

The old methods of mixing solutions by adding a little of everything at hand until the solution works satisfactorily is gradually disappearing, as the plater begins to realize that possibly some of the ingredients are unnecessary. We are all aware that many of the common formulas used today are the outcome of haphazard experiments and that many so-called "trade secrets" are compounded in this manner and are for the most part useless. There are but few of the "trade secrets" that would stand light of day and many owners of such "secrets" would wonder how they ever had faith in them should they once be submitted for unbiased comment. The chemist is in reality an enemy to trade secrets. He is in a way a detective and on analyzing a secret solution discovers that the secret so jealously guarded is merely some commonly used solution with some inert material added which is useless except so far as it gives the owner of the secret a good excuse for secrecy and an excellent chance to hoodwink others.

The chemist figures theoretically the quan-

* An address made at the meeting of the National Electroplaters' Association, held in New York City on January 16th.

§ Chemist for the Western Electric Co., New York City.

tity of different materials, knows their properties and action, whether they will mix without a chemical change taking place, whether they will have a poisonous effect and all the large and small things necessary to the successful outcome of his work. He is like the engineer and other professionals who have a definite object in mind and work on scientific principles to obtain results.

There are many platers today who follow the chemists' line of work and a number of these are well versed in chemistry; but there are also many who are neither the one nor the other and they are the ones who ten years from now will be just where they are today, if not further down the scale. The day of the old-time plater and his secret formulas and methods is passing and passing rapidly, and modern methods and modern platers are coming rapidly to the fore, and before long chemistry will be the *open sesame* to the best positions offered.

The thing to remember, however, is that success will not come to even the chemist plater unless he realizes that to attain success he must put behind him all the old ideas and distribute his knowledge freely to others. Our valuable trade papers have done much to advance the plater by publicity and if the new plater, benefiting by the knowledge he has gained by reading these papers, will write of his experiments and observations instead of hiding them away in the back of his head as has been the custom, he will be doing himself and the members of his profession untold good and will gain far more than he would under the old regime. The opportunity for the new plater was never so great as it is now that we have an association for the purpose of disseminating knowledge of the profession to the profession. Those who believe in the idea of the new plater should not hesitate to come forward voluntarily and contribute their support to the Association. Time will show that those who do this will be the ones who believe in the wonderful opportunities open to the plater who has a knowledge of chemistry and they will be the ones who will contribute their knowledge and state the results of their experiments and investigations the most readily. The main fault with the papers prepared by the old-time plater lies in the fact that his arguments are seldom convincing; he lacks the necessary knowledge of chemistry that would not only clinch his arguments but would also give him the feeling of confidence in his results only obtained by those who have accomplished their end by careful scientific investigation and not by hearsay or by careless methods.

There is no doubt that the plater is beginning to realize the advantages that chemistry holds for him and there are many today who are spending their days hard at work and their evenings pouring over chemical text books or in classes at night school. Many of these men are middle-aged and have families and they realize that their earning capacity will be increased by a knowledge of chemistry and therefore do not hesitate to sacrifice their evenings to study in order better to provide for the future. These men and the younger generation who are studying chemistry while they are learning the practical part of plating are the ones to whom the greatest credit is due and their success is certain. The future will see the electroplater a chemist with absolute certainty unless he be so short-sighted as to neglect the physiological moment that opportunity offers.

The "Rusting" of Nickel Deposits.

Frequent complaints are heard about nickel plated goods which turn yellow with age. It is usually supposed that nickel does not rust, so to speak, and when pure it does not. The cause of the "rusting" of nickel deposits, if this term may be used, is the presence of a small quantity of iron in it. The more iron that is deposited the more rapidly will the deposit turn yellow. In four samples of nickel deposits analyzed we found 1.11%, 2.20%, 1.89% and 1.67% of iron respectively. These were regular deposits obtained from nickel solutions used in large establishments and which were considered in good working condition.

In the investigations carried on some time ago by Messrs. Calhane and Gammage, they found that from 0.10% to 0.14% of iron was obtained in the best nickel deposits from anodes rather low in iron and using a still solution. If the solution were agitated or the cathode rotated, the iron was greatly increased. Increasing the current density also increased the quantity of iron in the nickel deposit.

When nickel plated goods of this character are exposed to the air, a slight tarnishing takes place after some time, then a dull coating appears, and finally the "rusting" occurs. All nickel anodes contain iron (and it has been demonstrated that it is necessary to produce an anode that does not become passive in the solution) and this finds its way into the solution. As the solution becomes old, the amount of iron in it increases until a very old bath may contain a large quantity of iron. The nickel deposit from it then is apt to contain considerable iron.

In order to prevent the contamination of nickel deposits with iron, it would seem that a still solution is preferable to an agitated one, and that it should not be used too long. A weak current is also preferable.

For a black color that produced by oxidizing silver in a hot liver of sulphur solution is far more durable than oxidized copper.

A New Automatic Buffing Machine.

A new machine for automatically buffing metal goods has recently been placed upon the market by the Automatic Buffing Machine Co., 20 Indiana St., Buffalo, N. Y. The machine is herewith illustrated in Figs. 1 and 2, and is intended to be operated with any modern standard buffing lathe. They are constructed in pairs so that one may be placed at each side of the lathe. In Fig. 2 is shown the machine for general use and when used,

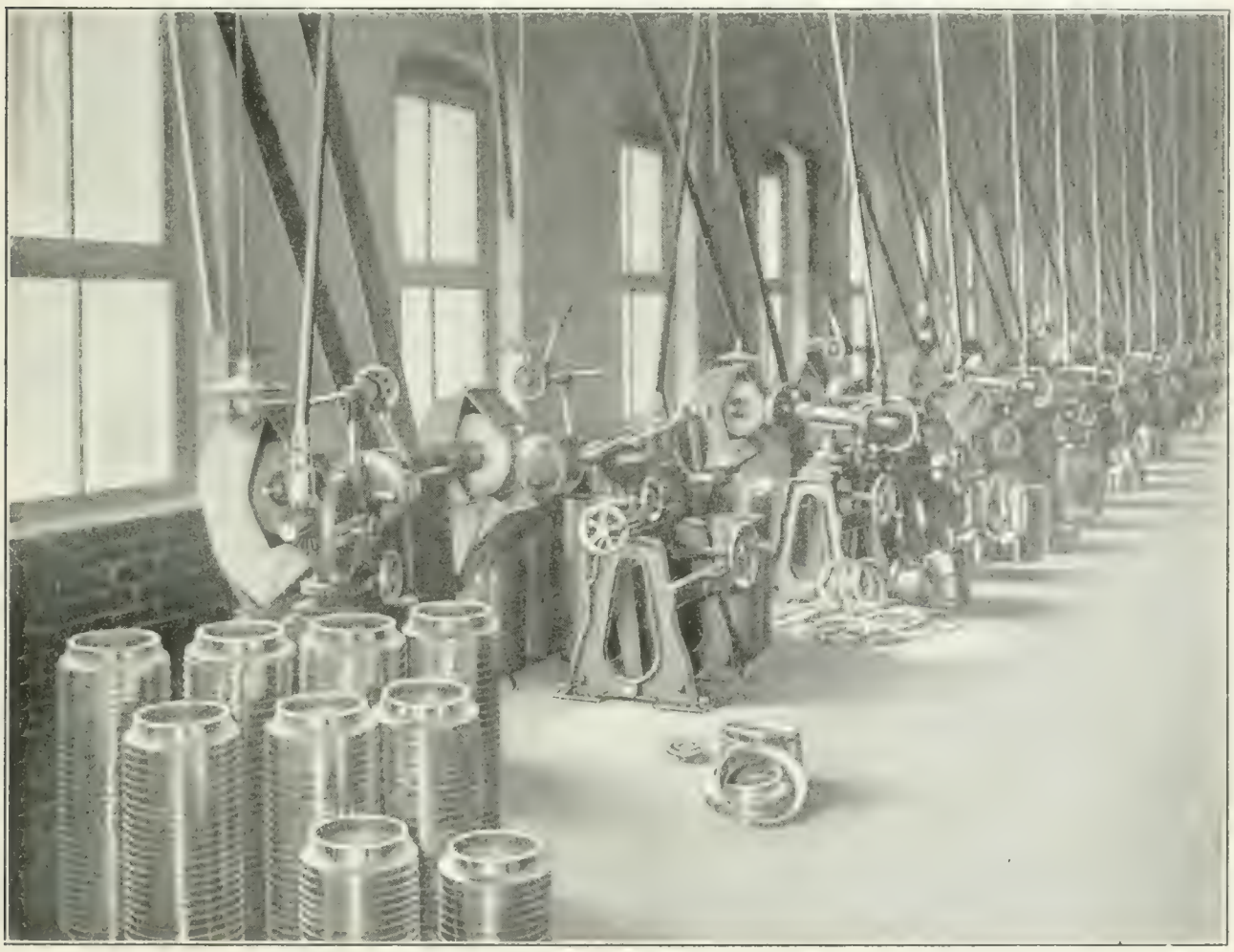


Fig. 1. Interior of the Polishing Room of the Badger Brass Co. at Kenosha, Wis., Showing 14 Machines Made by the Automatic Buffing Machine Co. of Buffalo, N. Y. in Operation on Automobile Lamps.

it does not interfere with the regular buffing as it may be removed in a few moments leaving the buffing lathe free.

The article to be buffed is chucked on the end of the machine as shown in Fig. 1 and the driving is accomplished by an overhead mechanism similar to a countershaft. The power is transmitted to the machine by means of a vertical shaft. A boy can operate a pair of machines. Owing to the uniform pressure

against the buff, it is unnecessary to use the highest grade buff wheels and cheap wheels are quite suitable. When operated, the shell or other article to be buffed is fed against the buff wheel in a manner that duplicates that of hand buffing. Any shapes may be buffed, and the machine is adapted for a large variety of work. One of the articles upon which it is now extensively used is the buffing of brass automobile lamps. Any concern which

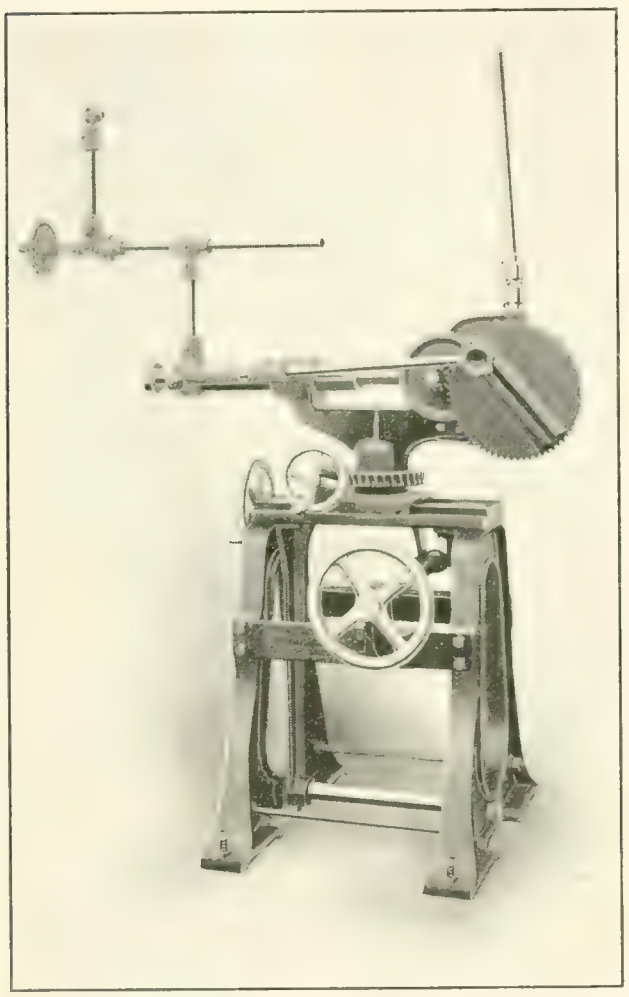


Fig. 2. Type "B" Machine for General Polishing and Buffing.

is doing buffing, will find the machine worthy of investigation. It is particularly adapted for large work, such as fire engine and fire extinguisher work which is usually quite cumbersome to buff; in addition the automatic feature of the buffing is also obtained.

The amount of any metal deposited per second is dependent upon the number of amperes which flow through the solution per second. If one ampere deposits a certain weight of metal per second, two amperes will deposit twice as much in the same time.

Zinc Dross.

We have frequently been asked the question: How much dross will a ton of spelter produce? The question is difficult to answer for the reason that it depends upon the quality of spelter produced and the heat at which it is maintained during the galvanizing.

Zinc-dross is really a misnomer as it is not dross at all but an alloy of zinc and iron. As the amount of iron in the zinc increases, the melting point is also raised, with the result that when the content of iron reaches three or four per cent, the melting point is much greater than the zinc and a pasty mass known as "zinc-dross" is obtained which is ladled out into molds.

The quality of the spelter is an important feature in the quantity of dross formed. The more iron that is contained in the spelter, the greater will be the quantity of dross. If, for example, a spelter contains one per cent of iron, it has already in it this amount towards the formation of dross, and if it be assumed that four per cent of iron in the spelter produces dross, then the spelter containing the one per cent of iron should produce twice as much dross in a given time as a spelter free from iron.

The heat of the spelter is another important feature in the formation of the dross. The greater part of the iron in the dross is obtained from the kettle, particularly the bottom, the hottest portion. If this becomes red hot, as it frequently does, then the spelter acts upon it readily and an excessive quantity of dross is produced.

To keep the quantity of dross as low as possible, a spelter as low in iron as can be obtained should be used, and care taken to maintain the spelter at as low a temperature as possible. For ordinary work, many galvanizers now specify that spelter should contain not over 0.50 per cent of iron. If less is specified, the price of the spelter is too high for economical use in galvanizing.

The "spotting-out" of castings that have been plated, is usually caused by the oozing or working out of the plating solution that has penetrated the porous imperfections, and which a rapid rinsing does not remove.

Failure in Practice of Non-Ferrous Metals and Alloys.*

By T. Vaughan Hughes.

One of the most interesting papers read at the meeting was that read by Mr. Hughes. He gave his experience with an interesting case of a fractured brass loco-tube which had corroded internally near the fire-box end. The presence of a deposit of basic sulphates of copper and zinc was regarded as indicating corrosion by the sulphur in the coke fuel used, aided by the carbon monoxide produced by charging damp coke on to the fire during stoppages for steam raising. The structure of the metal pointed to local overheating, in consequence of the formation of a hard external deposit, which contained a heavy mineral hydrocarbon, subsequently traced to cylinder oil in the water tank.

His explanation of the cause of fracture is as follows:

It is reasonable to infer that the cause of fracture of the tube under working pressure was due to corrosion proceeding from the inside towards the outside of the tube, and that the tube had not been overheated and oxidised as cupric and zinc oxide were absent in the "scale" and salts. After sawing the tube longitudinally and opening, it was observed that the corrosion was not continuous throughout the length of the tube, being more marked at the ends, and particularly at the firebox ends, and on one-half of the inside circumference. An exhaustive microscopical examination (1-inch lengths) of the tube, longitudinally and transversely, showed the crystal gains to be larger at the ends than in the middle parts. About the area of fracture the crystal size was equivalent to that produced by maintaining a 70/30 brass of equal dimensions at a temperature of 800° C. for about ten minutes. The crystal size at the end farthest removed from the fracture was smaller, resembling that of an equal dimensioned piece of brass heated for ten minutes at 700° C. The central portions of the tube were normal, both longitudinally and transversely, proving that one tube had been annealed at about 600° C. The crystals at the seat of breakdown were uneven, those nearest the fracture being much larger than in an area 90° to 180° from it. The boundaries of the largest crystals were corroded and embraced intrusions of cuprous oxide.

Obviously, then, the tube as supplied by the makers was passable as a commercial production. Slight overheating had taken place at the ends of the tube—possibly for expanding purposes. Abnormal overheating, however, had occurred near the fracture, which abutted the firebox.

As the temperature of the water under the boiler-pressure used was about 360° Fahr., it might have been advisable to anneal the tube in process of manufacture at as low a temperature as possible. However, the manufacturer was not to blame here, as large crystal grains would have been formed in other portions of the tube had it been unevenly or over-annealed in the mill. The overheating had taken place after the tube left the manufacturer.

A chemical examination of the coke used as fuel proved it to contain 0.89 per cent of volatile and 0.37 per cent. of sulphur fixed in the ash. Such a coke would supply all the sulphur necessary for bringing about above results.

The inquiry concerning the tube so far showed that by over-heating of the ends of the tube, particularly the fire-box end, the grain structure had been so enlarged that incipient disintegration had taken place—that is, the texture had been enlarged, and the crystal boundaries became permeated with films of lower oxides, thus undermining the strength of the alloy.

During the discussion, the following remarks were made by one of the members and by the author:

Dr. Rosenhain, in opening the discussion, said he found it a little difficult to accept the view that a film of non-conducting material only one-tenth of a millimetre thick should so enormously retard the flow of heat as to allow the temperature of the tube to attain a heat of 800° C., or anything like it. He did not say the thing could not happen; but he found it difficult to believe it. He asked Mr. Hughes if he had examined other tubes taken from the same furnace and subjected to the same conditions, and, if so, he would like to know if they had all broken down in the same way. If not, they would have to look elsewhere for the cause of the overheating. He did not think Mr. Hughes was justified in concluding that the overheating took place after the boiler

* Abstract of a paper read at the meeting of the Institute of Metals, held in London, England, January 18th. and 19th.

tubes had left the maker. He had had occasion to investigate a case where a tube had failed under the vibration existing on board ship. It was found that the tube had been locally overheated. The general appearance of the micro-structure resembled that of the case under consideration. There was no possibility of that overheating to 800° occurring on the ship. It must have been done in the process of manufacture. The overheating was more marked on one side of the tube than on the other, just as in the present case. He would like to have a complete analysis of the brass embodied in the tube. He found that the presence of a somewhat large percentage of lead, something over 0.3 per cent., led to corrosion either by liquids or by acid fumes. The question of the lead content of brass was an important one from that point of view.

Mr. Vaughan Hughes, in reply, said the fuel that was used happened to be coke. He found no trace of chlorides of either copper or zinc in any of the deposits he had dealt with. The soluble matters seemed to consist of chloride and sulphate of lime. The analysis of the tube was as follows:

Copper	70.65
Zinc	28.65
Iron	0.56
Lead	0.20

The possibility of abrasion by clinkers had been considered and met before the trouble with the tube arose, the owner having given strict instructions to his men as to the care to be taken in the blowing and general management of the locomotive.

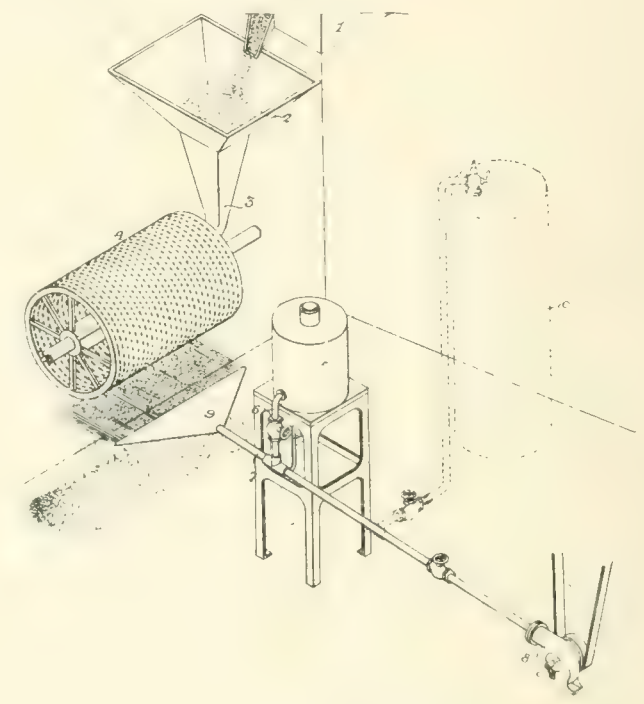
While an acid dip is satisfactory for cleaning bronze or brass castings, the nitric acid used is expensive, and the sand-blast will be found more economical.

In oxidizing copper or silver by means of liver of sulphur, the surface of the metal must be clean otherwise the oxidized surface will be spotted or lack uniformity.

If chromium and copper be melted together in an electric furnace and an alloy of the two metals obtained, this alloy may then be used to add chromium to brass and bronze as it may be melted in an ordinary melting furnace.

The Preparation of Sand for Core Making.

The usual method of preparing sand for core making is to place a quantity of each kind of sand on the floor of the foundry. The mixture of sand to be used for the purpose has previously been decided upon to suit the castings to be made. The sand is now wet with water containing the binder, or a dry binder is mixed with the sand and the whole mass afterwards wet with water. The pile of sand is then shoveled over and riddled to mix it thoroughly when it is ready for use. Many modifications are in use, of course, but the essential principle is the same. In other words, the core sand consists of a mixture of sand of the proper grade, a binder and water.



Sketch of Robeson's Process of Mixing Core Sand.

Jacob S. Robeson of the Robeson Process Co., of Camden, N. J., the well known makers of core compounds, has recently patented a process for mixing the binder with the core sand (U. S. Patents, 947,128 and 947,129, Jan. 18, 1910). The core-sand, of the desired mixture that is best suited for a particular class of work, is delivered to the hopper 2 from which it falls to the sieve 4 and through which it is sifted. While the sand is passing through the revolving sieve the core binder of a suitable kind is sprayed against it through the nozzle 9. The core compound dissolved in water is supplied from the tank 5 to the pipe

through which the blast of air is blown, either by the blower 8 or from a steam boiler, if desired, as indicated by 10.

It is claimed that the use of this method of applying the binder gives a more intimate mixture than can be obtained by hand work, and less of the binder need be used. The result is a core that is less apt to blow when the metal strikes it.

In the second patent the core itself is claimed as a novelty when made in this manner with the binder subsequently mentioned. The binder itself was patented in 1904. It is the waste liquor produced in the manufacture of sulphite wood pulp. It contains all the gums and resins of the wood and the inventor calls it an "acid resinate". Beyond this particular use in the manufacture of cores, it has no value. In making wood pulp from wood chips, the wood is cooked in digesters with bi-sulphite of lime which disintegrates it and leaves it in a fibrous condition for the manufacture of paper. The gums and resins and other substances in the wood are extracted and the liquor that is obtained from the strained pulp is known as "sulphite liquor". It has been considered a waste product and is usually thrown away. The aforesaid inventor, however, has found that by evaporating the liquor in order to remove the large excess of water, it may be obtained in syrupy form suitable for use in cores and sufficiently concentrated for satisfactory transportation.

For a resist in etching all metals, there is nothing better than an asphalt varnish. Benzole is the best solvent for it although ordinary asphalt paint may be used. Pure asphalt dissolves but slightly in benzine or gasoline. When dissolved in turpentine the varnish takes longer to dry than when benzole is used although it is a good solvent.

The melting of Monel-Metal is a problem that is usually beyond the average brass founder, as his furnaces are not capable of producing the necessary heat. The metal then remains so long in the fire in order to melt it, that blowholes and excessive oxidation occur with the resulting poor castings. A high heat is necessary to produce the rapid melting required to produce good castings.

The Use of Lacquers.*

By W. A. Jones.§

I am convinced that the best method to use lacquers is to mix them with brains and apply them with enthusiasm. If you must omit either, don't omit the enthusiasm. I have known men accredited with brains who were rank failures; I have never yet known an enthusiastic man who did not win a fair measure of success. The most hopeless situation is to go into a lacquer room and find the head man a listless time server. By all means, wake up! Keep up with the times and you will be happy in your work and of great value to your house. I find an enthusiastic man can get good results with a single lacquer on ormolu gold, polished silver, oxidized brass and verde antique, while another has trouble if he has a special lacquer for each finish. I do not advise one lacquer for all purposes. I only wish to show that a great deal depends upon the man.

Lacquers have been used almost entirely to prevent metal from tarnishing until in the hands of the consumer. From this standpoint the lacquer room presented little of interest, but was rather the vermiform appendix, a necessary nuisance in the making and marketing of metal goods. I regret to say the situation has not, as yet, changed very much.

Originally a house was painted to preserve the wood. To-day, our architects, the best of whom are genuine artists, use paint to preserve; but by using brains in selecting the color scheme, produce most pleasing effects, yet the paint still protects and the cost of the work is no more. In house painting, the days of the white house with green blinds have gone.

A change is gradually appearing in the finishing of metal. It is not here, but in sight. I am in hopes the Platers' Association will help along the education; if not, it must come from the architects. If the architect demands that the finish on building hardware, lamps and fittings of all kinds must be in accord with his decorative schemes, men will certainly be found to produce the finishes.

I cannot believe that you, who represent both the hands and brains of plating and lac-

* An address made at the meeting of the National Electroplaters' Association, held in New York City, January 16th.

§ General Manager of the Celluloid Zapon Co., New York City.

quering will be driven into this work by competition, when by taking the work in hand now you can use this idea to advance yourself, your house, and the position of plating and finishing in this country. I have made a pretty careful study of the plating and lacquering situation in this country. The progress in plating is far greater than in applying lacquers. The reason is easily found. Within a month, I asked a plater and finisher just how certain work was lacquered. "Oh, I leave that to the girls in the lacquer room. I don't bother with that. I'm a plater" was his answer. The name of his firm is known from Maine to California, and yet knowledge of how his plated work was lacquered was really too small for him to consider. He thought applying lacquer required no care or brains, for the simple reason that he knew very little about it. If the late Prof. Brooks could find enough about the oyster for study to take up a good part of his life, surely the plater and finisher can well devote some time to applying lacquers. As you learn more you will see greater and greater opportunities. I might add that the work of Brooks has saved the oyster from extermination and preserved an enormous industry.

The greatest need to-day is to have the designing, plating and lacquering either in charge of one man (if one sufficiently broad can be found) or else in the hands of men who work in perfect accord, and on a basis of equality. The lacquer work of the future is decorative and this involves color work. The contrasts of light and shadow can make or mar a color scheme. A raised design with etched or irregular background will look well in verde antique while the same finish on flat work or colonial design is usually without character and difficult to produce, as the slightest defect shows on a smooth surface.

I could elaborate on the relation between design and finish, but from the above you can readily follow it out. Design should be carefully considered by all manufacturers. Even more are plating and finishing interdependent. Take black nickel. If deposited rapidly and with too much current, it is almost impossible for the lacquer man to get a lacquer to hold.

In the same way when work is flashed in copper for producing sulphide black (or so-called oxidized finish) a spongy copper deposit will often be lifted entirely off as the lacquer dries. In many cases I have heard this described as peeling of the lacquer when the black itself has peeled.

Still more important than the above is brass plating for different finishes, or brass with nickel added. This can be run from pale yellow to full red, yet the exact shade is of the greatest importance. If the lacquer room does not get the right color they are helpless. If they know the shade they want and get it, they can reproduce almost any color scheme, and it will certainly cost no more to have the brass plating right than to have it wrong. If the plater and lacquerer work together they can reproduce on different colors of brass plating all shades and finishes of gold, including green gold, the gold smut finish, ormolu, Roman, etc. This can be done without using any gold, getting the colors entirely with lacquers by applying different colored lacquers on different colored brass plating. The colors cannot well be seen by gaslight, but I can easily illustrate to anyone by daylight. It is well, in most cases, to start with yellow brass, for gold colors require yellow and red. You cannot work down from red brass by introducing the yellow, but you can easily work in the red with your lacquer.

So important do I consider the relation of plating to lacquering that I will not undertake to work out color schemes when I find these two departments in separate hands and not in accord.

I will mention, in detail, some decorative tendencies. We all realize the added importance of the bathroom. Having porcelain tubs and wash basins, this was followed with glass shelves, towel bars and door knobs. Now there is being made and offered plumbing and faucets in white—also gas and electric fixtures, door knobs, escutcheons, and even electric push plates. This means that the entire bathroom can be finished in white, giving the appearance of absolute cleanliness.

The influence of woman is felt in everything and no doubt it is well that this is so. She is directly, or indirectly, the ultimate purchaser of nearly all metal goods, for metal goods are used mostly in the home, for personal use. Harmony of color and the use of pleasing combinations and contrasts, are receiving more attention as the education and culture of the country increases. In metal work, we have confined ourselves mostly to individual metals in their natural colors, clear lacquered, or have used oxidized copper,

verde antique or Bower-Barff. Oxidized copper has been absolutely run into the ground. Verde antique is good on lamps, desk fittings, etc., but even this is becoming antiquated. Bower-Barff goes well with mission styles, but here again we refer to a fad and one that is going out.

I leave it to you if a brass door knob on Flemish Oak is good taste. What have we in gas fixtures to harmonize with the present popular color "Old Rose?" So through the list I could go. In the days when a woman wore a red hat and a brown dress, such things made no difference. That day has gone. Some day we will find a few people in a position to supply metal goods to harmonize with any color or material, then we will wonder why these things were not sooner considered.

The rapid advance in color work we see already in millinery trimmings. The best work comes from Paris, but in the last two years rapid progress has been made in a few shops in this vicinity. The foundation has been laid, for the importance of design and character of plating has been realized. A few concerns from small beginnings have doubled and redoubled their business. Also color plating on jewelry has made rapid progress. We have the various shades of gold plating, and are now getting into the smut finishes, such as the green smut on gold by adding lead. Other smut finishes in different colors will undoubtedly follow.

On many lines, and on large color work, plating is too costly, and the range of color is very limited. We have at hand everything needed to get any color scheme, and by using the same materials in lacquers that the decorators have used for years. I refer to the standard pigment colors. These when properly ground and incorporated with the correct shades of celluloid lacquers give the lacquer man the identical materials used by the decorator. These standard pigments will not fade and the finish produced is quite durable. In working out effects to harmonize with woodwork, wall coverings, etc., it is customary to use a design having some relief, and the plating is acid dipped or sand-blasted, rather than buffed. The high lights are wiped off while the celluloid enamel is wet, or the enamel is allowed to dry and the work relieved by buffing or scratch-brushing lightly. The work is then given a very thin dip in lacquer, or, better still, is sprayed.

A more economical method is to thin out the enamel until it will not cover the work, then dip this in thin enamel and lay the work flat to dry. In this way the enamel will be very thin on the high lights so the metal will show through, and thicker in the background. On work where this method is not practical a spray is used and the thin enamel is sprayed on. These celluloid enamels can be bought, or, if properly equipped, the lacquer man can make them. I would advise in grinding colors into lacquer that the mill be grounded to prevent generation of electricity.

You can readily see how a color can be made to harmonize with oak, by using yellow with a little brown added. A mahogany shade is gotten from reddish brown with a little black added. In selecting pigments only the standard non-fading artist's colors should be used, and these should be ground repeatedly, as success depends on the fineness of the grinding. Here again the design and character of plating must be considered.

In addition to these wiped effects, where most of the color is removed, another type of color work is being produced. For this the spray is essential. By incorporating various proportions of celluloid enamels into clear lacquers and spraying this mixture, nearly all the plating finishes can be reproduced. These finishes are translucent and are not wiped off. Take yellow brass, acid dip it, then spray on a good spray lacquer with a little yellow enamel added, and a splendid imitation of ormolu gold is obtained. Red brass handled in the same way gives a good Roman gold. Black and white on matt nickel gives a good imitation of French-gray silver.

I could enumerate all the other finishes, but it is unnecessary. What I wish to impress upon you in what I have said is:

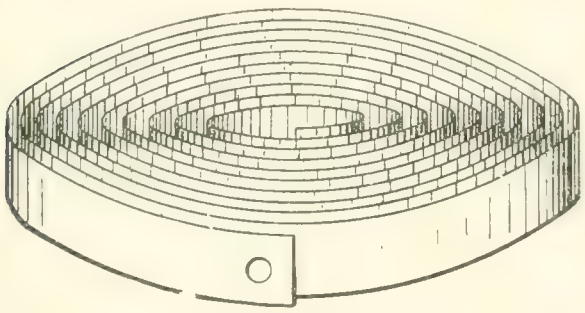
Enthusiasm is an essential in doing good lacquer work. The designer, the plater and the lacquer man must all work together to get results. Future progress in lacquer work will be along decorative lines.

Although cobalt is a metal which closely resembles nickel in its properties, its deposit obtained by electrodeposition has no advantages over it. Cobalt, however, has a slightly pink shade while nickel has a faint blue tint.

The Employment of Tantalum as Springs.

Tantalum is one of the most remarkable and interesting of the rare metals. It has a very high melting point, and on this account is used with much success as electric lamp filaments. It is non-corrosive and by alloying may be made as hard as steel. These properties allow its use as surgical and dental instruments.

One of the recent applications of tantalum is for watch springs and its use has been patented (U. S. Patents, 946,993, 947,146 and 947,147, Jan. 18, 1910). The patentee, Werner von Bolton of the Siemens & Halske Co., of Berlin, Germany, the well known manufacturers of electrical appliances, has been instrumental in increasing our knowledge of tantalum and has discovered many new and valuable properties of it. The advantage of tantalum for watch springs is because of the fact, that while it may be made as resilient as steel, it is non-corrosive and does not become magnetic.



Manner of Making the Tantalum Spring.

The tantalum employed for making articles of this nature is first obtained in the wet way from its salts, and is then well fused in a vacuum by an electric current. Such a fusion not only renders it dense and homogeneous, but also purifies it from gases which it may contain. In this fused form it may be rolled, hammered or drawn into wire although quite hard. During the working it hardens rapidly and requires frequent annealing. This is accomplished by heating to redness and slowly cooling. The heating requires much care, and while the metal, even in the form of the thinnest wire, may be heated to a low red heat with only a superficial oxidation and discoloration like that which forms when steel is similarly heated, a temperature beyond it injures the metal.

Although the pure metallic tantalum is hard, it may be rendered still harder by alloying it with other metals. Carbon is used as the hardening ingredient in most cases as it is in steel. It is also introduced in the same manner by imbedding the tantalum in charcoal powder and heating to redness. Iron is also used for hardening the metal for special cases, and in some instances aluminum and tin are both employed.

Werner von Bolton is responsible for the statement that the alloyed tantalum may be made so hard that it exceeds that of the hardest steel, and is exceeded in hardness only by the diamond itself. This statement, while apparently unconfirmed by other investigators, has not been challenged, and accepting it as accurate, it would seem that tantalum is equal or superior to corundum or carborundum in hardness, and what is more remarkable, it is a metal and not a non-metallic substance. It is undoubtedly, the hardest metal.

A Die for Producing Helically Fluted Wire.

A novel form of die for making spirally fluted wire has been patented by Charles H. Ballou of North Attleboro, Mass. The manner of making the die is herewith illustrated. In Fig. 1 is shown a front view, while in Fig. 2 a cross-section is illustrated. The patent (U. S. Patent 946,631, Jan. 18, 1910) is upon the use of a ball bearing die sleeve which turns as the wire is fluted.

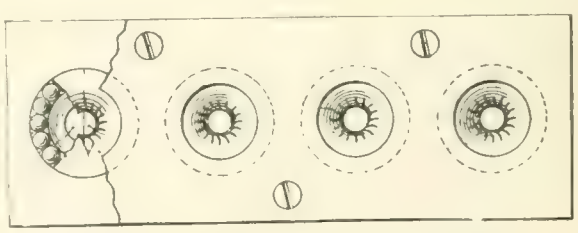


Fig. 1. Front View of the Die.

In Fig. 1 the manner of inserting the sleeve is shown. The hole is fluted and the sleeve rests upon a series of balls. In Fig. 2 the exact method of making the die may be seen. The sleeve A is inserted in the die block and is held in place by the cap screwed on the face.

The sleeve, which is the real die, is fluted and hardened, and the wire is then drawn through it in the usual manner.

In Fig. 1 is shown a draw plate with a number of dies in it. The object is to provide a gradual formation of the helices on the wire. In the first die, the corrugated surface is partially formed. In the next it is still further shaped, and in the subsequent ones the operation is completed.

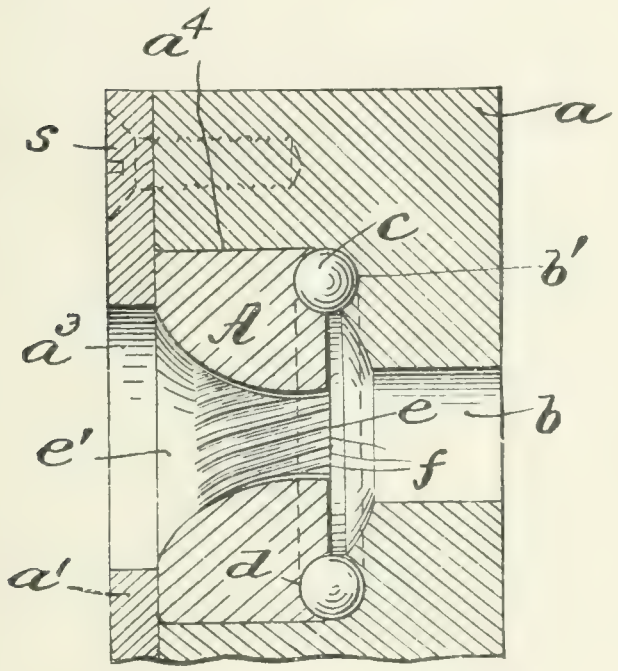


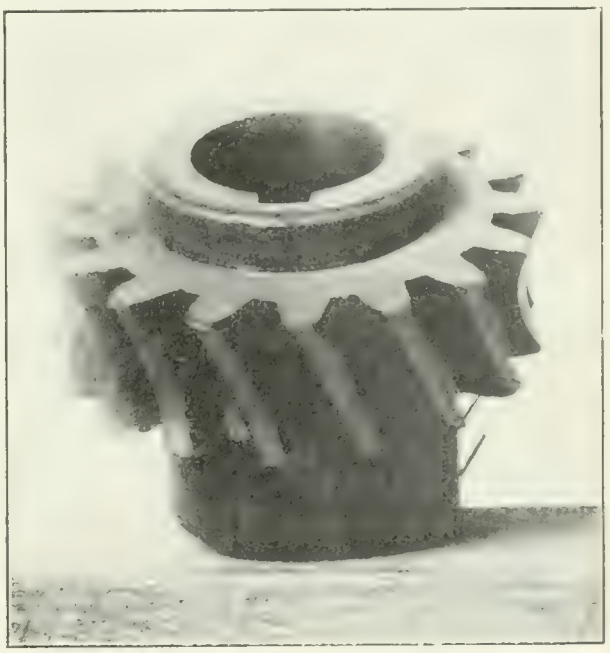
Fig. 2. Cross-Section of the Die.

Tubing may be as readily drawn as the solid wire if the interior first be filled with lead or wood to prevent collapsing. Such tubing is useful for making gas and electric fixtures and similar ornamental work.

Manganese Tin Bronze for Gears.

A satisfactory alloy for a gear must have a number of good points and even with the cheapness and strength of steel, either cast or rolled, bronze gears are still extensively used. It is a well demonstrated fact that two similar metals do not form good wearing surfaces when used as bearings. For example, a steel shaft revolving in a steel bearing never gives good results; but a bronze bearing and a steel shaft do work well. The same is true of gears. A bronze gear working in a steel or iron pinion, or *(vice-versa)* always gives the best service.

A bronze gear, in order to give the best service, should be hard and sufficiently tough to avoid breakage by shock. The so-called 88-10-2 mixture gives fairly good results, but is not sufficiently strong to stand in many instances. Manganese-bronze is strong, but owing to the difficulty in casting it, many brass founders have not found it suitable for



Manganese-Tin-Bronze Gear.

their work. A gear is frequently a difficult piece to cast and a metal which does not shrink excessively is preferable. For cases of this nature, a manganese tin bronze will give good results and cast well. A mixture that has given good results for the work is the following:

Copper	87 lbs.
Tin	10 lbs.
30% Manganese-Copper	3 lbs.

The copper and manganese-copper are melted together and then the tin is added and the whole stirred and is then ready for pouring. The bronze is improved somewhat by a second melting. Zinc is unnecessary, and if used, it decreases the strength.

It is cheaper to use plenty of nickel anode surface in plating so that the nickel is obtained from the anodes and not from the solutions. Nickel in the anodes is cheaper than that in the salts.

A Contribution to the Study of Phosphor-Bronze.*

By O. F. Hudson and E. F. Law.

The authors made an extensive research upon the properties and characteristics of phosphor-bronze and obtained many interesting results. A novelty in the shape of colored micro-photographs, made by the Lumiere process, of etched surfaces of phosphor-bronze were exhibited to the members of the Institute, and which created much astonishment, both on account of the new idea and the completeness of the work.

From their researches, Messrs. O. F. Hudson and E. F. Law believe that the malleability of these alloys is due, first to the solubility of copper phosphide in the annealing process, giving rise to a homogeneous, single-solid solution; and, secondly, to the influence of the tin present, this constituent preventing the formation of a phosphide eutectic, so that the phosphide is evenly distributed as small rounded particles through the mass. Thus the addition of 5 per cent. of tin was found to raise the breaking load from 3.8 tons to 14.5 tons per square inch, the yield point from 3 to 7.1 tons, and the elongation from 3.5 per cent. to 17.5 per cent. on a two-inch bar.

For cast bronzes the composition varies with the purpose in view, but the maxima of tin and phosphorus are about 12 and 1.5 per cent. respectively; and such bronzes form good bearing metal, the hard ternary eutectic particles being embedded in a softer matrix, the latter soon wearing down and leaving the load to be supported by the hard particles. Where lead is used in bearing bronzes, it does not alloy with the copper, but forms minute globules of metal, which have a lubricating effect and increase the plasticity of the whole.

The paper created considerable discussion and the following remarks were made by members of the Institute:

Mr. Spence Thomas, speaking as a practical user of phosphor-bronze for twenty-two years, said one expected to derive considerable advantages from the use of phosphor-bronze in preference to ordinary brass for bearings, and, possibly, through the co-operation of makers of phosphor bronze and the users of the alloy, those expectations might one day be realised. He had had phosphor-bronze bearings running in his hot rolling mill which lasted sometimes only one month, while at other times they lasted fifteen months. Such a wide disparity when the bearings were used under identical conditions could only be due to some fault in the mixture or to the heat treatment of the alloys. He hoped that the producers would succeed in giving them something more uniform and which would last longer even than fifteen months.

Professor Thomas Turner said the ordinary person who used phosphor-bronze spoke of it as if it were one material. Those who were familiar with the working of the alloy knew that there was a great difference in the properties of various kinds of phosphor-bronze, almost as great, perhaps, as the differences between cast iron, wrought iron, and steel. They also knew that different results could be obtained either by some variation of the constituents or by varying the heat treatment. One kind of phosphor-bronze which might be specially suitable for drawing into wire would be entirely unsuitable for the production of bearings and *vice versa*. The members of the Institute were indebted to the authors of the paper for valuable information which would enable metallurgists to know—when that knowledge came to be applied—how to treat certain alloys which at present presented difficulties. Sometimes manufacturers of phosphor-bronze wire had considerable difficulty in complying with the specifications given to them. Manufacturers would be glad to pay a reasonable sum of money if they could learn how particular varieties of phosphor-bronze could be treated so as to enable them to get over their difficulty. It was, however, only by approaching the subject in its scientific aspects that that end could be achieved. He had read the analysis given in the paper with much interest. To the ordinary chemist the analysis of phosphor-bronze was not easy to estimate. They sometimes lost the phosphorus. But the method given in the paper was extremely simple, and, he understood from the authors of the paper, it was quite satisfactory. If for nothing else they were greatly indebted to the authors for giving them that method.

* Abstract of a paper read at the meeting of the Institute of Metals, held in London, England, January 18th and 19th.

A New Self-Atomizing Oil Burner.

An oil-burner of entirely new principle has been placed upon the market within the past few months by the American Combustion Co., 45 West 34th St., New York City. This burner is novel in that the oil is atomized by the burner itself and does not require air or steam pressure for it. It is claimed that more perfect combustion is thus secured with all the advantages of a soft, even heat. The regulation of the burner is simple and the quantity of oil required to produce a given amount of heat is thereby readily secured.

The burner works upon the centrifugal principle and may be obtained for either high or low pressure service. When used, it atomizes the oil in a sort of mist as shown in Fig. 2, and for this reason, the makers have suggested the name of "Nebulizer" for it. Various models of the burner are manufactured, giving either a long or short flame or of varying widths. In Fig. 1 the various parts of the burner are shown.

The great advantage claimed for the burner over the injector types, is that the oil is atomized mechanically and does not use any air or steam for atomizing purposes.

Fig. 2. Spray of Oil Thrown by the Burner.

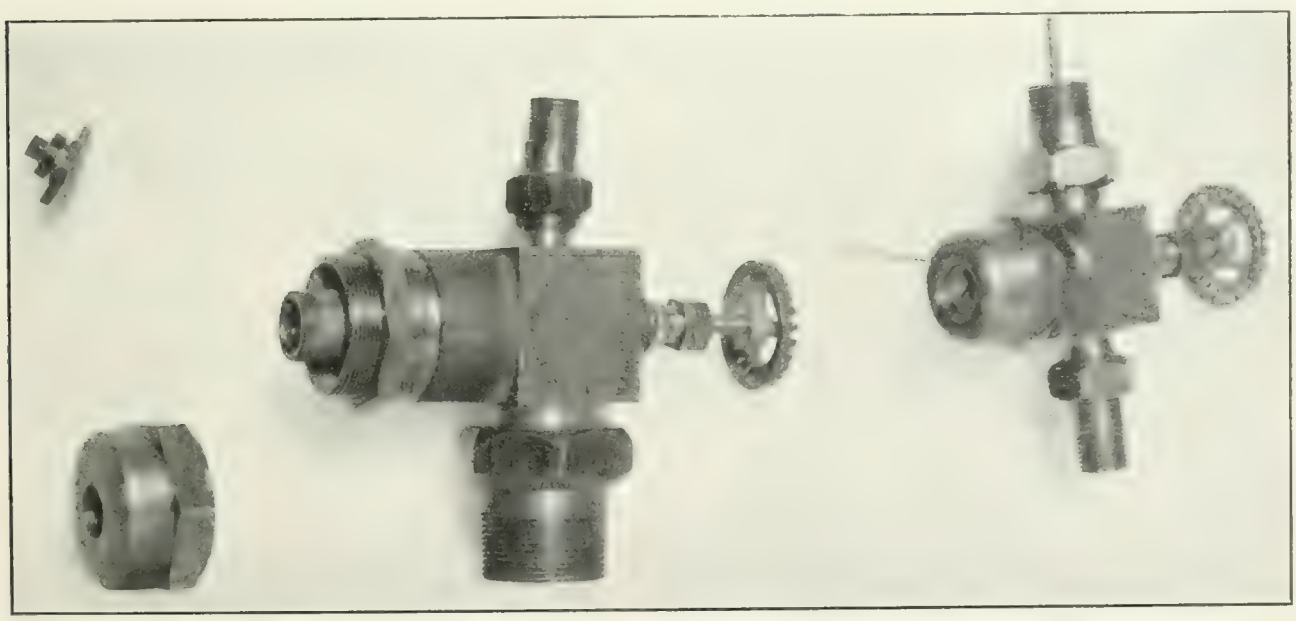


Fig. 1. Complete Burner and Parts Showing Method of Making the Self-Atomizing Device

Nearly all of the benzine now sold on the market is in reality gasoline and the results obtained from them are identical in practically all instances. The two names are now used indiscriminately.

Heavy nickel deposits are frequently not as good as light ones and are more apt to peel or strip. For many uses, a light nickel deposit is perfectly satisfactory and nothing is to be gained by using a heavier one.

The Cleaning of Metal Work.*

By S. D Benoliel.§

The efficient and economical cleaning of metal work of all kinds before plating, tinning, dipping, galvanizing, japanning etc., is a more difficult problem than is generally considered by those who usually perform these operations. If the scrub brush is used, the operation is an easy one, but if the work is to be cleaned rapidly, with a minimum amount of work with the smallest amount of materials and without in any way affecting the finish of the metal the proposition then turns out in a great many cases to be a rather difficult one.

The proper cleaner to use depends not only on the character of the material to be removed, but also on the nature of the metal to be treated and the operation that is to be performed on the metal after it is cleaned.

If a piece of brass work is buffed and is to be lacquered, the cleaner must be of such a nature that it will not in any way affect the finish of the brass so that after it is cleaned, the work can be immediately lacquered and the work still have the appearance of being properly finished.

If, again, a piece of iron is to be cleaned for plating the proposition is a much easier one, for most cleaners will not detrimentally affect its finish. The cleaner used in this particular case must have the property of cleaning the iron rapidly without any scouring so that the work will be chemically clean, otherwise the metal deposited would be likely to peel off when the article is buffed. If this same piece of iron is to be cleaned between machine operations; or is to be put away in stock or be packed for shipment, the above cleaner would be entirely unsatisfactory for it would clean the work so well that it would soon rust and produce considerable trouble.

When you consider the large variety of metals that are to be cleaned, such as iron, steel, brass, bronze britannia, aluminum, soft metal, zinc, tin-plate, silver-plate, nickel-plate, etc., and when you consider the large number of materials to be removed, such as vegetable, animal and mineral oils, buffing compositions of all kinds, made up with a large variety of binders it can be readily seen that it would be impossible to clean all classes of work with the maximum efficiency and economy with a few cleaners. Nevertheless this is what has been really attempted by a number of concerns who have hitherto handled this end of the business. The more progressive manufacturers have, therefore, been compelled to do a lot of experimenting, adopting that material which has given them the best results. This of course, does not necessarily mean that the ideal cleaner for that particular class of work was adopted.

The International Chemical Company is the first concern in the United States and probably in the world that have changed this practice. We have developed a complete line of cleaners particularly adapted to the preparing of all kinds of metal work before plating, tinning, galvanizing, dipping, japanning, etc. Instead of following the old method of selling people just what they ask for, or recommending the same article for a large variety of work we always make a special effort to induce the concern to give us all the details concerning the nature and class of work they clean, so that our expert can study carefully each case and make such changes as to methods and materials that would improve their conditions and reduce their expense.

While it would be impossible to explain in detail the proper cleaners to be used for all the various classes of work as well as the conditions that are met in practice, it would be interesting to give a general classification of the line of cleaners that are ordinarily used in the cleaning of metal work, and to give you some idea concerning their general properties, their advantages and disadvantages and their limitations. It will also be interesting to illustrate with practical examples some of the conditions that exist in the larger plants which would go to show the advantages that these concerns would gain by expert advice in this line and to show the general ignorance displayed regarding the proper cleaners to be used under various conditions.

All materials generally used for the cleaning of metal work can be divided into four classes. The first class contain are those that clean by solution. The second are those that clean by emulsification. The third that clean by chemical action. The fourth that clean by mechanical action. A great many of the cleaners used really belong to more than one

* An address made at the meeting of the National Electroplaters' Association, held in New York City, January 16th.

§ General Manager, the International Chemical Co., Camden, N. J.

class. Very often it is difficult to place the cleaner in the proper class. This classification, however, will be found useful when making a systematic study of these materials.

The first class of cleaners that clean by solution act by dissolving the material on the work, the material removed dissolving in the cleaner used. To this class belong such materials as benzine, alcohol, turpentine, carbon tetra-chloride, etc. When these cleaners are used, the particles removed are not changed in composition and, therefore, remain distributed through the entire mass of the cleaner. Most cleaners of this kind are volatile and it is therefore possible in a great many cases to distill off the cleaners used which can be recovered and the residue would then contain the articles removed. Cleaners of this kind soon become saturated with impurities and must be thrown away or recovered by distillation. Benzine, naphtha and kerosine are the cleaners belonging to this group that are used to a great extent in factories, cleaning metal work. They are very objectionable owing to their being inflammable and are not economical owing to their volatile nature causing considerable of the material to be lost by evaporation. They have the advantage, however, of dissolving rapidly the bulk of the material to be removed. They do not, however, clean the work sufficiently well so that the articles cleaned can be plated, tinned, lacquered, etc.

In the majority of cases where benzine is used for cleaning metal work, it is adopted because the concerns do not apparently know of a substitute for this article. Its use depends to a great extent upon ignorance. After it is once introduced in a factory for any kind of work it is then greatly abused owing to its being convenient and because it cleans the work rapidly. In the majority of cases other cleaners could be used which would not be dangerous and would be more economical. The reason articles cleaned in this material cannot be plated, is due to an oily deposit which is left on the work after the benzine has had a chance to evaporate. In a great many cases benzine could be cut out entirely and the second cleaner alone would prepare the work satisfactorily eliminating entirely the first operation of using it.

A good illustration concerning the abuse of benzine recently came to the writer's notice. A factory (which is one of the largest of its kind in the country) has a separate building devoted to the cleaning of work in benzine. In that building there were some thirty men employed doing this kind of work. The amount of benzine used was so great that they have a still in operation for the recovery of this material. One can readily realize what would occur to the thirty men in that plant if a fire once got started. When the writer spoke concerning the advantage of eliminating this material owing to the difficulty in taking care of its insurance, he was advised that they carried their own insurance. While this concern was able to stand any losses that might occur, still it certainly was their duty to eliminate this article if it were only from the standpoint of preventing the danger to which their men were exposed.

The second class of cleaners which clean by emulsification act by emulsifiing or combining mechanically wth the materials to be removed. To this class belong such materials as soap or soap compounds which consist of soap mixed with various chemicals and a large variety of chemicals which do not combine chemically with the material to be removed, but which, nevertheless, exert a cleaning action.

When these cleaners are used, the articles removed are not changed in composition. There is absolutely no chemical action. The material removed remains mechanically mixed throughout the entire cleaner. Cleaners of this kind soon become saturated with the article removed and must be thrown away; but as a rule this class of materials do not become contaminated as rapidly as those belonging to the first class. They are generally of a non-inflammable nature and do not, therefore, possess that objectionable feature of cleaners belonging to the first class. These cleaners generally do not clean the work rapidly and must be used hot. They therefore, differ very materially in these two respects from cleaners belonging to the first class. These cleaners as a rule clean the work sufficiently well so that the articles cleaned can be plated, but if the proper cleaner is used the next cleaner need only be used as a dip.

To this class belong those cleansing compounds which are the most important in the cleaning of certain kinds of metal work which are the least understood and where there is room for a great amount of research work and development. Unfortunately chemistry does not help us out as much as might be

expected in the study of this class of compounds, and while it enables us to work them out scientifically and systematically, still a large part of the development is due to practical experience. As far as I know, no thoroughly systematic study has been made of this line of cleaners.

The third class of cleaners act chemically by combining with the material on the work forming an entirely different substance. The new material formed goes into solution. To this class belong such materials as potash, lyes, caustic soda, potassium cyanide, acids, etc., etc. An example of this kind is when a potash combines with an oil or grease making a soap which goes into solution. The soap being, of course, entirely different than either the cleaner or the article removed. Most cleaners of this kind act rapidly, must be used hot and the substances formed by chemical action on the materials to be removed do not rapidly contaminate the vat. This kind of cleaners should always be used wherever possible, as they are generally the most economical in cost and the most rapid and efficient in operation. When the proper cleaners of this kind are used they generally clean the work so that they can be plated without scouring. The work, of course, has to pass through the proper dips before being ready to plate.

Strange to say, a great many cleaners are used belonging to this class which are supposed to exert a chemical action but which do not act at all chemically on the material to be removed. As a result, the articles to be cleaned must be scoured and if they are not scoured very often the cyanide or acid dip cleans the work sufficiently well so that they can be plated. There are a great many cases where the acid or cyanide dips are really the most important cleaner in the operation.

The fourth class of cleaners act by mechanically throwing off the material to be removed. The electrical cleaners belong to this class. The electrical current is passed through the solution and gas is given off at the work which helps the cleaning action of the solution. Materials used as electrical cleaners generally belong to one or more of the other classes. The best results are obtained when they belong to the third class which means that they also clean by chemical action. Unfortunately most of the electrical cleaners that are used do not clean in this way, their main virtue being due to the gas that is produced at the work. Electrical cleaners are generally used hot, and their main advantage is due to their cleaning work rapidly. One of the disadvantages results from the necessity of connecting them up electrically and because they generally do not clean highly colored work made up of oxidizable metals satisfactorily, as they have a tendency to tarnish it. Electrical cleaners, as a rule, should never be used when the work can be cleaned without the use of the current, as they complicate the cleaning operations and must be more closely watched than when ordinary dips are used. Where a large number of cleaning tanks are in operation the electrical feature is very objectionable.

In a factory doing a large variety of work it is generally a difficult proposition to decide on the number of cleaners to be used. Where there are a number of departments, each taking care of one class of work, one is usually warranted in recommending a cleaner best adapted to the work of each department, independent of the number of cleaners that would have to be used. Under these conditions the most economical and efficient results would be obtained. In the smaller factories where there is a large variety of work and where the work is all treated, say in one room, the proposition is a much more difficult one. The material recommended must take care of several classes of work and must, therefore, be a compromise cleaner. The cleaner should be such as to take care in the most efficient manner of the bulk of the material cleaned. This can very often be done by introducing such modifications in the use and doctoring up of the cleaner so as to take care, in a fairly satisfactory manner of most of the work to be cleaned.

It may be surprising, but it is, nevertheless, true that some of the worst conditions concerning the cleaning of metal work exist among the larger plants. The reasons for this are due to a number of causes. There seems to be a tendency to use those materials that can be easily obtained in the stock room. A great many cases could be cited where the material used throughout the factory is the same as that used in the plating room. In a certain plant for example where sal soda is used in large quantities for the manufacture of a certain material, it was found that it was used almost throughout the entire plant for the cleaning of all kinds of metal work imaginable independent of whether the material

was to be plated, japanned or cleaned between machine operations. This often results in considerable trouble.

An illustration of this trouble was seen in another large plant where we were asked for a material that would satisfactorily remove japan from iron work. Investigation showed that all the work which was rather difficult to clean was put through a solution of sal-soda before being japanned. The cleaner was wanted for removing the japan from the spoiled work. A proper cleaner for preparing the work before japanning was introduced which resulted in all the work being japanned in the future without further trouble.

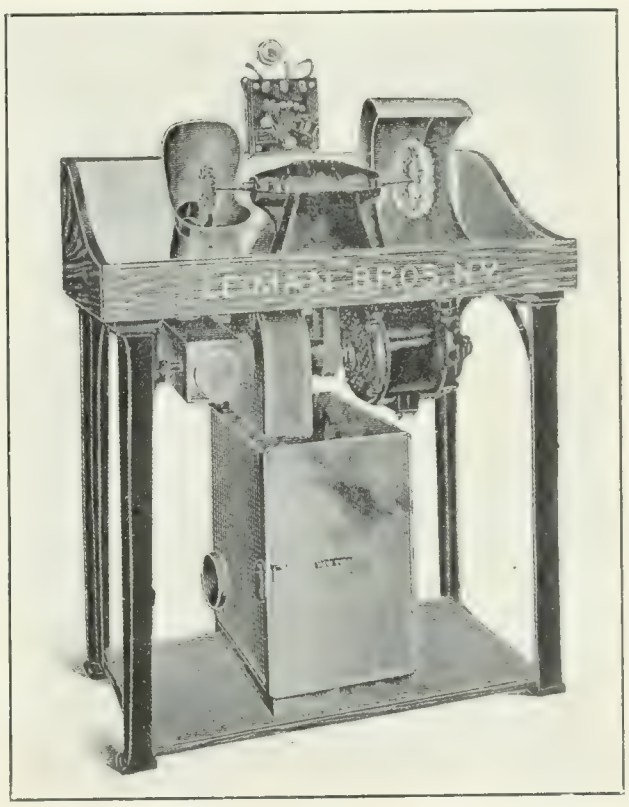
Another cause for the conditions existing among the larger plants is because the cleaning of the work is considered to be of minor importance. It is often left largely in the hands of men who are unacquainted with the value and the proper kinds of cleaners to be used for the different classes of work. These men very often know that the cleaner is unsatisfactory, but are unfortunately unable to keep in touch with outsiders who are likely to give them information concerning the proper cleaners and methods to use under certain conditions.

In some of the cases the trouble may be due to the purchasing agent objecting to introducing a number of materials. He believes that this would make it more difficult for him to purchase a number of cleaners in small quantities at the right price than if he purchased only one article. Again, the failure to introduce other cleaners results very often from the use of the benzine in the factory. A great many men object to the substitution of this article by other cleaners owing to the fact that it is very rapid and convenient.

Summing up the entire situation, it is fair to say that the careful study of the proper cleaners and methods of taking care of metal work of all kinds preliminary to plating, dipping, lacquering, japanning, tinning, etc., is one that has been greatly neglected and one upon which there is considerable room for improvement. It seems that the most logical way to take up this matter would be for manufacturing concerns to get in touch with those who make a special study of these operations, as well as those who have had considerable experience and who are in a position to make definite recommendations as to the proper materials to be used. This would prevent them from being compelled to try out all these things which may be recommended to have some merit.

The "Leiman" Polishing and Dust Collecting Apparatus.

A new and useful polishing apparatus has recently been placed on the market by Leiman Bros., 62 John St., New York City. It is intended for use in small establishments in which polishing, scratch-brushing, buffing and similar operations are done.



Leiman Polishing and Dust Collecting Outfit.

The apparatus consists of a rigid stand upon which is mounted a trough-shaped top to contain the dust from polishing and prevents its spreading upon the floor. Upon the top is mounted a motor driven polishing head with two spindles. Underneath the wheel and covering them, hoods are placed which connect with pipes leading to a collecting system with a suction fan which draws the dust into the collector, thus making the apparatus practically dustless.

The speed is readily adjusted by the rheostat shown, and a tight and loose pulley driving mechanism renders it possible to stop the polishing head without stopping the motor. The spindles take buff and brushes up to 8 inches in diameter so that the machine may be used for work of good size.

A New Copper Plating Solution.

A new copper plating solution for the electrodeposition of copper upon brass, iron, steel, zinc or other metals has been discovered by Edward F. Kern of Knoxville, Tenn., and patented by him (U. S. Patent, 946,903, Jan. 18, 1910). One half of the patent has been assigned to Percy F. Brown of New York City, chemist for the Western Electric Co. The inventor describes the patent in the following manner:

"I have discovered that a smooth, dense, coherent and adherent deposit of copper may be obtained by the electrolysis of a bath containing fluo-silicate of copper in solution. Particularly good results may be obtained by the use of a soluble alkaline or alkaline earth fluo-silicate preferably ammonium fluo-silicate with the copper fluo-silicate and that the operation may be further improved in some cases by the additional employment of an alkaline fluoride. Ammonium fluoride either alone or with an organic salt, preferably an alkaline tartrate is advocated.

For iron, steel or zinc, I prefer to employ the following materials in the proportions specified:

Water	100	parts
Copper fluo-silicate	12	"
Ammonium fluo-silicate ..	8	"
Ammonium tartrate	6	"
Ammonium fluorid 5 or more		"

Where the copper is to be deposited on iron, steel or zinc, I employ the solution in a neutral or slightly alkaline state, the bath being maintained in such condition by the use of a suitable alkali preferably ammonia.

Where the copper is to be deposited on brass, copper or certain other metals, the bath may be acidified with free fluo-silicate acid or it may be maintained in a neutral condition in which case I preferably employ aluminum fluo-silicate instead of ammonium fluo-silicate.

It is to be understood that in the bath for depositing copper upon brass, copper or certain other metals aluminum fluo-silicate is the equivalent of ammonium fluo-silicate for the purposes of my process.

I have found that it is advantageous, when using the bath in an acid condition as hereinbefore referred to, to add gelatin or tannin to the bath preferably in the proportion of one part of the solid gelatin or one part of the concentrated extract of tannin to about 2,000 parts of the bath. The gelatin and the tannin mentioned are, it is to be understood, equivalents for use in my process and either or both may be employed as desired.

In the electrolysis of my improved bath, I employ an anode of copper or an anode consisting of an alloy the greater part of which is copper.

In order to restrain the separation of silica in the operation of my process, I have found it advisable to add ammonium fluoride from time to time. This material is added to the bath at the outset in the preferred proportion of one part by weight of ammonium fluorid to one or more parts of the copper fluo-silicate in the electrolyte. The addition of the ammonium fluoride thereafter may be made as required.

While I have stated the proportions of the materials which I prefer to employ, it will be understood that these proportions may be widely varied, and that commercially satisfactory results may be obtained, omitting certain constituents of the bath as hereinbefore mentioned or by replacing the ammonium fluo-silicate with aluminum fluo-silicate.

Copper in ingot form, when used for making brass castings, gives better results than copper wire on account of exposing less surface to oxidation.

Many shapes made of cast brass may now be readily produced from rods made by the extrusion process. Sections are cut off and the castings thus imitated. Extrusion metal is usually made of 55 parts of copper and 45 parts of zinc. The rods are much stronger than the average brass casting.

The Water-Blast Blowpipe and its Use in Furnace Work.

Where power can be obtained, a gas blowpipe is easily operated with air pressure; but when it cannot be had, a foot blower has previously been necessary. This method of making a blast is quite unsatisfactory as it

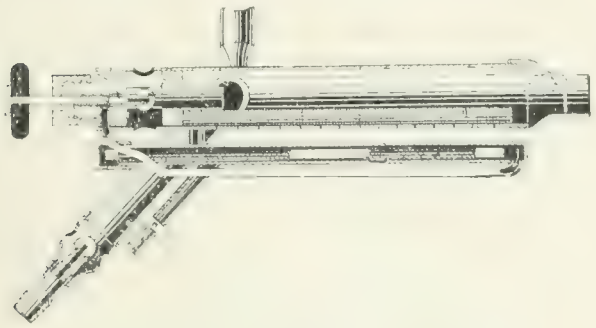


Fig. 1. Detail of the Water-Pressure Burner.

not only requires manual labor, but constant attention for frequently quite a time. The air pressure, too, is unsteady.

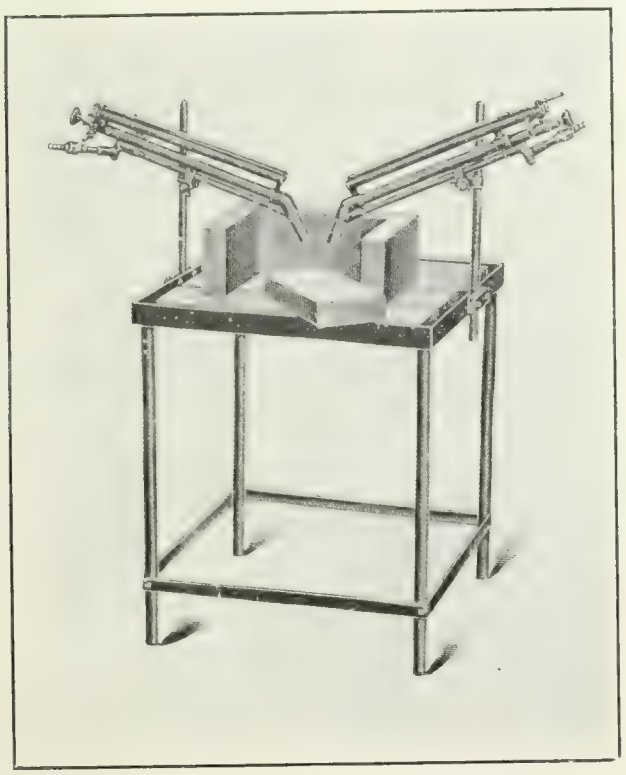


Fig. 2. Brazing Table with Blowpipes. No Air Blast is Used.

A blowpipe operated by water has recently been constructed so that it is possible to obtain a gas blast for many classes of work without the installation of any blower operated by foot or power. The blowpipe in cross-section is shown in Fig. 1. A pail or tank of water is hung on the wall and connected to the burner by means of a rubber tube. Ordinary illuminating gas is used for the fuel. As the water passes to the burner it forms steam under pressure which in turn acts as the blast.

The blowpipe is so simple that it at once appeals to those who desire to operate small

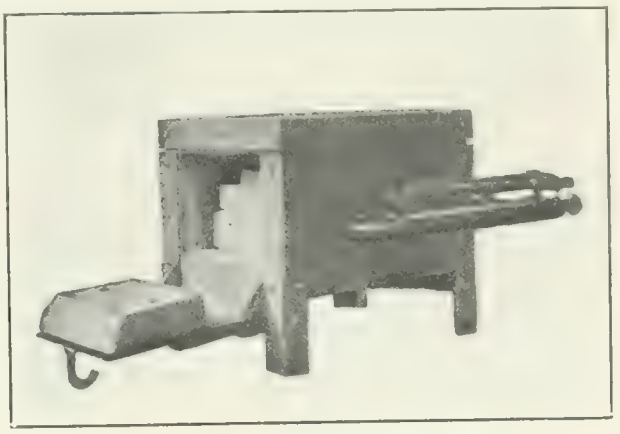


Fig. 3. Muffle Furnace.

furnaces or use a blowpipe. No equipment other than the blowpipe is necessary. In Fig. 2 are shown two blowpipes used for brazing in the regular manner. In Fig. 3 a small muffle furnace may be seen. The blowpipe may be readily applied to a small melting furnace in

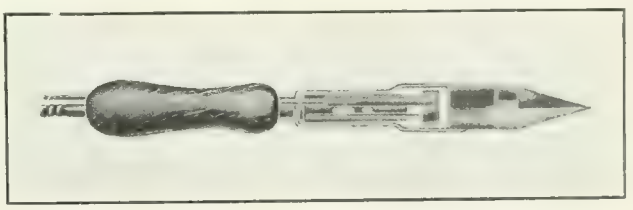


Fig. 4. Soldering Iron Operated with the Blowpipe.

the same manner. In Fig. 4 a hand soldering iron operated by the blowpipe is shown. The simplicity of the blowpipe is such that it will unquestionably find many uses for a large variety of work. It is manufactured for the trade by the National Economic Gas Blast Co., 20 Gold St., New York City.

Although platinum plating can be done successfully and forms a bright, adherent electrodeposit, it is not used at all in the manufacture of jewelry or other objects of ornament. The color of platinum so nearly resembles nickel that it is not popular. The platinum deposit obtained is quite hard and durable.

Correspondence.

Coke vs. Oil for Brass Melting.

By T. P. Gourley.

I regret that, owing to a misunderstanding about the date of publication of The Brass World, the reply to the article by A. L. Belfield in the November issue has been unavoidably delayed, and I now take pleasure in giving my answer to his article.

There is no economy of space of any importance in an oil furnace over a coke furnace. I refer, of course, to furnaces which use crucibles, either of the tilting or stationary type. While it is true that the fuel storage takes up less room for oil than for coke as the tanks, in most cases, are buried in the ground, the high cost required to install a system of this kind is such that it takes a long time to pay back the investment. In fact, where a plant is located near a railroad and the coke does not have to be carted, there is very little to be gained by the use of oil, when the equipment necessary to run the oil from the tank to the furnaces, such as the pump and the steam-coil inside the tank to heat the oil is taken into consideration.

Regarding the amount of ashes to handle in a coke tilting furnace, it is so small that it is scarcely worth considering. A small wheelbarrow full accumulates in a day's run in melting several thousand pounds of brass. In fact, the ashes from this type of furnace can be used for making cores, as the fuel is burned to a pure ash.

Mr. Belfield's statement of having obtained 43 heats from a No. 150 graphite crucible is quite astonishing to me. It is a better average than that obtained in a coke tilting furnace using a graphite crucible imported from Europe which, as far as my own observation goes, has proven superior to any made in this country.

Mr. Belfield appears to believe that the only cost of melting is the fuel cost. He neglects to take into consideration the cost of operating, the air system which requires from 1 to 5 lbs. to atomize the oil. Also the cost for operating the pump, furnace linings, interest on investment etc. If he figures out the total cost of operating, he will find that the figures come to about 18 cents per 100 lbs. of brass, as I stated in the October issue of The Brass World.

In regard to the two per-cent loss, I will say that it is probably possible to melt a high grade of red metal and keep it down to this amount. It is also possible, with red metal to hold to specifications of chemical analysis. Referring to the shop loss, I would assume that from the bad condition of the crucible shown, the castings poured with metal from it would show considerable slag when finished. The inside of the crucible shows quite an amount of slag, and by melting brass in it in this condition the loss would amount to more than a two per cent shop loss. The bottom of the crucible plainly shows the effect of the oil flame that entered the side and struck against it. I think if Mr. Belfield had shown both sides of the crucible, it would have given a better opportunity for forming an opinion.

Pickle for Nickel Alloys, Such as Monel-Metal.

A new pickle for nickel alloys, such as Monel-Metal which, as generally known, consists of nickel, copper and iron, has been patented by John Fairfield Thompson, chemist for the Orford Copper Co., at Bayonne, N. J. (U. S. Patent 947,067, Jan. 18, 1910).

The pickle consists of sulphuric acid and water in the usual strength employed for pickling copper and brass, but to it a ferric salt is added. This salt is preferably ferric sulphate and the proportions used need not be exact.

It is well known that nickel and alloys of nickel and copper are difficult to pickle. The oxide that remains on the surface after annealing clings tenaciously to the surface in the pickle and it is only after some time that the surface is cleaned. By the use of the ferric sulphate, however, in conjunction with the regular sulphuric acid pickle, the inventor claims that the oxide is more rapidly and effectively removed, and the reprecipitation of the copper by the nickel is obviated. The pickle is heated to about 150 degrees F. when used, as it then works more rapidly. For pickling Monel-Metal and other nickel alloys high in nickel, the solution seems to have much advantage. The ferric sulphate is cheap, and in many instances may be obtained as a by-product.

The Assay of Industrial Gold Alloys.*

By Ernest A. Smith.

The main points in Mr. E. A. Smith's paper are the importance of obtaining a true sample for assay, the quantity and application of the lead used in the assay, and the necessity for working with checks. The low-grade alloys employed by jewelers are pickled in the course of manufacture in order to remove the coating of oxide formed in annealing, soldering, etc., the superficial stratum being enriched in gold by the solvent action of the pickling acid on the other metals present. Hence in order to get a true average sample of the alloy this superficial stratum must be scraped off or the assay will come out too high (up to 10 per cent. in some cases). The amount of lead used in the assay varies with different workers, some taking a constant quantity whatever the grade of the alloy; but the author prefers to employ amounts, varying inversely with the proportion of gold, between 8 parts for 916.6 gold and 24 parts for 375.0 gold. He also prefers to add the lead in two separate portions, two-thirds the total being added at first and the remainder later, this practice giving a better elimination of the copper. Better results are obtained by a low cupellation temperature during the first stage, finishing off the charge at a higher temperature. It is considered that check samples of known composition and similar standard to the alloy to be assayed should be used in all cases where accuracy is desired, since without these checks the errors may amount to as much as 2.5 parts of gold per 1,000. When an exact determination of the gold and silver is desired, the author prefers to assay the gold by direct cupellation with parting silver, and the silver from a second assay piece by cupellation with lead only.

Some of the interesting remarks made during the discussion of the paper were the following:

Professor Gowland opened the discussion by remarking that although the paper was not likely to interest so many people as the one previously read, it was a valuable contribution to their proceedings. The information contained in it had never been published before, and its author, Mr. Smith, was one who was specially qualified by training, and also by his experience as an assayer for writing such a paper. Mr. Smith was a son of Richard Smith, better known, perhaps, as "Dicky" Smith—Dr. Percy's old assistant. Under his father, and also at the Royal School of Mines, Mr. Smith had a careful and thorough preparation for the work which he was now doing at the Sheffield Goldsmiths' Hall. With regard to the paper itself, Professor Gowland thought that the poor, low 9-carat gold frequently employed in England, was the lowest alloy which should be employed for jewelry. In fact, he would really not employ that alloy at all, but one which was much richer in gold. In Japan, in the beginning of last century, they had a similar alloy; but unlike the British alloy, which consisted of gold, silver, copper, zinc, and what-not else, that consisted of gold and silver only. It was white, but by a very elaborate process of pickling the silver was removed from the surface of any object made from it, with the result that they got a perfect gold surface. Objects so produced were practically undistinguishable from those of pure gold. With regard to alloys at present in use in Japan, that used for coinage was the same as that used in France and America, viz., gold 9 parts, copper 1 part. The Japanese preferred their gold to be the colour of an English guinea, and therefore all their jewelry was now made of the high standard alloy. The alloy was high in gold, but the metal alloyed with it was copper, with a considerable proportion of silver. With regard to alloys of gold and silver, and gold and copper, to which allusion was made in the paper, of course, when those were rich there was no segregation, and therefore there was no difficulty whatever in taking a sample. But, in the case of poor alloys, the ingot could not be assayed from a cutting, but must be assayed by first melting the ingot and then taking a dip assay. At Goldsmiths' Hall, and at the Sheffield Assay Office, articles of jewelry and plate were received in a nearly finished condition, and a most ingenious method was used of taking samples from those articles without really injuring them, and without preventing their being properly finished. Great difficulties had to be contended with, because all those articles which were low in gold had been subjected to a very severe pickling and

* Abstract of a paper read at the meeting of the Institute of Metals, held in London, England, January 18th. and 19th.

the surface was richer in gold than the layers below. Therefore it was absolutely necessary to remove the whole of the upper surface and to take the sample for assay only from the internal layers. That method was of much use in facilitating the practical working of the assaying office. There, of course, they knew what was the composition of the alloy, and therefore it was very easy for them in making up what was called a fire, *i e.,* a batch of assays, to make up at the same time a batch of "checks." But where the metal consisted simply of an alloy of gold and silver, it was usual in Japan, where there was not always time to make a preliminary assay, to obtain a fair idea of the composition otherwise. After practising with a series of alloys he became quite expert in determining the value of a sample by means of the touchstone. His long experience, and the many hundreds of thousands of assays he had made, had led him to the conclusion that one of the most important things in a gold essay was to have the temperature of the muffle right. If that was not regular or if too high, they might as well throw the whole of the assays away. They certainly should not report on them. Reverting, again, to poor gold alloys, Professor Gowland said that where there was much copper it was necessary to use a considerable amount of lead, and he found that the method which was mentioned in the paper was similar to one which he employed when dealing with large quantities of poor alloys received from the mines. The lead was divided into three portions; two portions were formed into balls of given weight, and one portion was made into foil, in which the assay bar was wrapped. In charging the assays into the muffle, a leaden ball was first passed in, and then the lead packet containing the alloy; when the assay was nearly finished the other ball of lead was added. By adopting that procedure he found that the resulting gold assay was much more free from copper than if the whole of the lead had been added at the beginning of the assay.

It is an error frequently made, to believe that metals can be buffed to a surface without first cutting-down. Only a "shine" is then obtained.

The "Adamite" Metal Polishing Machines.

The machines herewith illustrated are used for polishing metals of all kinds and shapes with the rapidity and satisfactory results that are now demanded by the trade. They are made by the Adamite Surface Machine Co., 365 Market St., Newark, N. J.

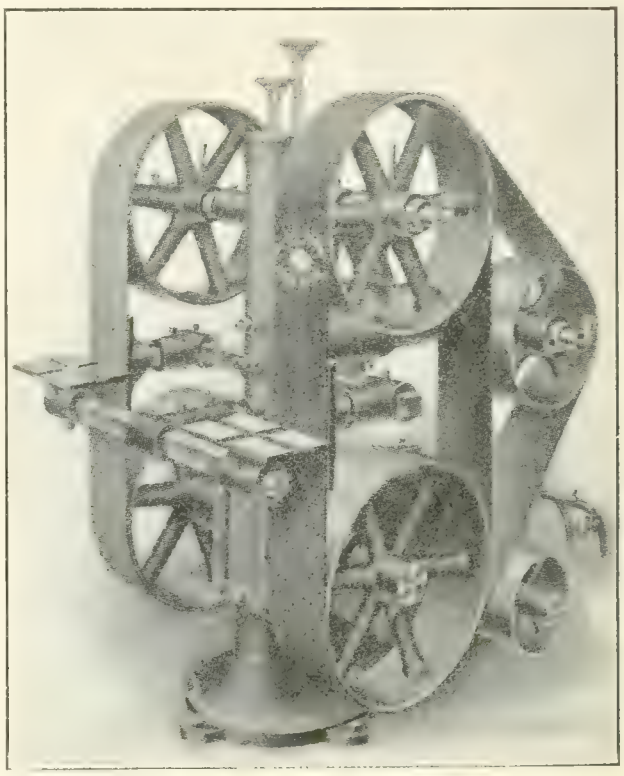


Fig. 1. The "Adamite" Double Belt Polishing Machine.

In Fig. 1 is illustrated a double machine for polishing or grinding a large variety of work. The machine consists of two belts running over a top and bottom pulley. The outside belt does the polishing and is also run over a loose pulley for rendering it tight. The work to be ground is held upon a table shown in the front of the machine. This table may be made of a variety of shapes to accommodate the various classes of work that are encountered in the trade. The belt is run at a high speed and flat and round work may be ground and polished with great rapidity. In the double machine, one side may be used for the coarse grinding of work and the other for polishing.

In Fig. 2 is shown a machine designed for polishing shafting or similar work. It is not intended for brass tubing or other classes of work for the reason that it polishes across the

work, but for heavy grinding and polishing on rough work it has been found excellent and used with the best of success.

The belt used upon the machines is made from "Adamite", an artificial abrasive made

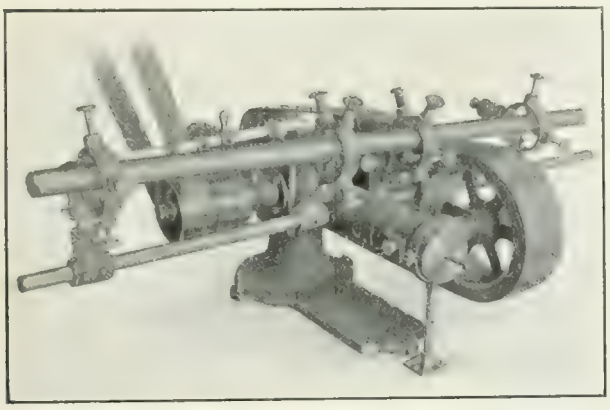


Fig. 2. The "Adamite" Polishing Machine for Straight Bars.

in the electric furnace. This abrasive possesses extreme hardness and is well suited for the work. The belts are made in all sizes of Adamite, from the coarsest for heavy and rapid grinding, to the finest grade for fine polishing.

The "Baird" Wire Forming and Ferruling Machine.

This machine, like its predecessor described in The Brass World, January, 1910, is the result of the demand for a machine capable

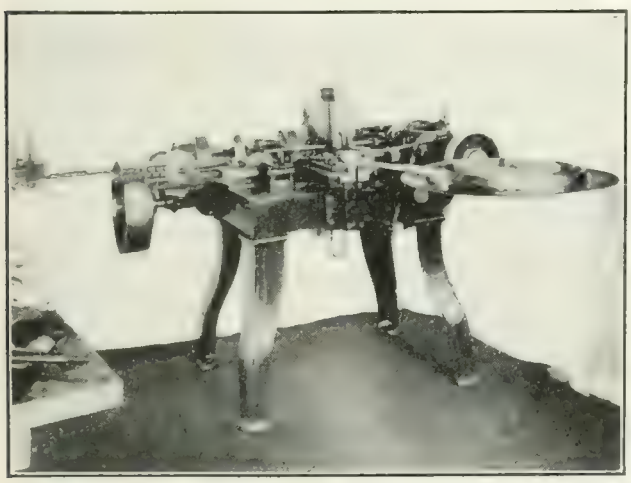


Fig. 1. The "Baird" Forming and Ferruling Machine.

of producing a variety of goods similar to those shown in Fig. 2. Suspender loops, buckles, easel stands etc., are now being made upon it with rapidity and of a high quality.

The machine, shown in Fig. 1, is a combination of two machines and it takes the wire from the coil, straightens it, feeds it and cuts it off in the length necessary for the article to be made. The goods are turned out at the

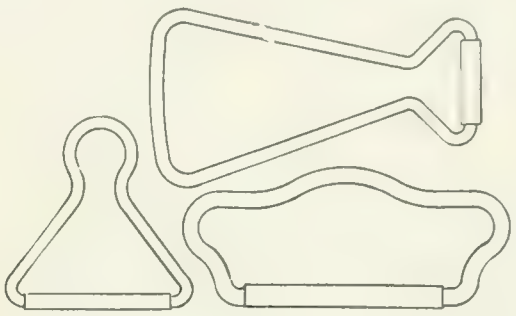


Fig. 2. Articles Made on the Machine.

rate of from 60 to 80 per minute. The machine is built of the highest grade of material and of the finest workmanship for which the Baird Machine Co., of Oakville, Conn., by whom it is made, are noted.

Correspondence.

What is the Cost of Electroplating?

Editor:

Knowing that The Brass World is always anxious and willing to receive information of interest to its subscribers and readers, I wish to make a suggestion that you encourage articles from experts on the management of electroplating and buffing rooms, and the best manner of arriving at the cost of production in such departments.

Take, for instance, the plating room. There are many platers to-day who are not familiar enough with the cost of the room to know how to arrive at it properly, and suggestions along these lines would be very valuable and thankfully received.

My own experience has shown me that some platers will charge 50 cents straight per hour for nickel plating work, regardless of the amount of time and material involved, while others will charge 40 cents, and the same holds good in the buffing department.

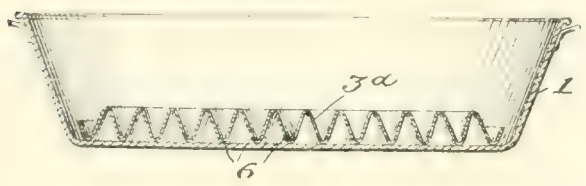
I would like to see an agitation in this line and I mention it to call your attention to the matter.

J. E. Pflueger.

A Simple Method of Cleaning Silverware.

A simple method of cleaning sterling-silverware or silver-plated ware, has recently been invented and patented by James D. Phillips and Carl Hambuechen of Madison, Wisconsin, (U. S. Patents 945,865 and 945,866, Jan. 11, 1910). The method is as follows:

A round sheet or disc of corrugated zinc is cut so that it will fit into the bottom of an enameled iron vessel such as an ordinary basin. The tops of the corrugations are covered with tin or solder. Only the tops of



the corrugations should be covered, and the rest of the zinc must be left bare. The basin is filled with a solution made by dissolving some bi-carbonate of soda in water. The silver articles such as spoons or forks that have become tarnished, are placed in the solution on the zinc disc and lie on the soldered or tinned tops of the corrugations.

An electrolytic action is at once set up and the discoloration is removed. The object of tinning the top of the zinc disc is to provide a permanent contact for the spoons or forks. In time, the zinc becomes covered with a deposit and a bad contact is thus obtained. By tinning the portions coming in contact with the articles to be cleaned, the zinc only is coated and a permanent contact is secured. While the zinc coats over sufficiently to prevent a good contact were the portions at the top not soldered, such a coating does not interfere with the electrolytic action.

This process seems to be a very cheap and satisfactory method of removing the tarnish from silver goods of all kinds and may be used with equal results on both flat-ware and hollow-ware provided they are not lacquered or greasy.

Some Interesting Work With the Oxy-Acetylene Blowpipe.

Some interesting work has recently been done with the oxy-acetylene blowpipe by the Oxy-Carbi Company, 516 Orchard St., New Haven, Conn. This process is also called

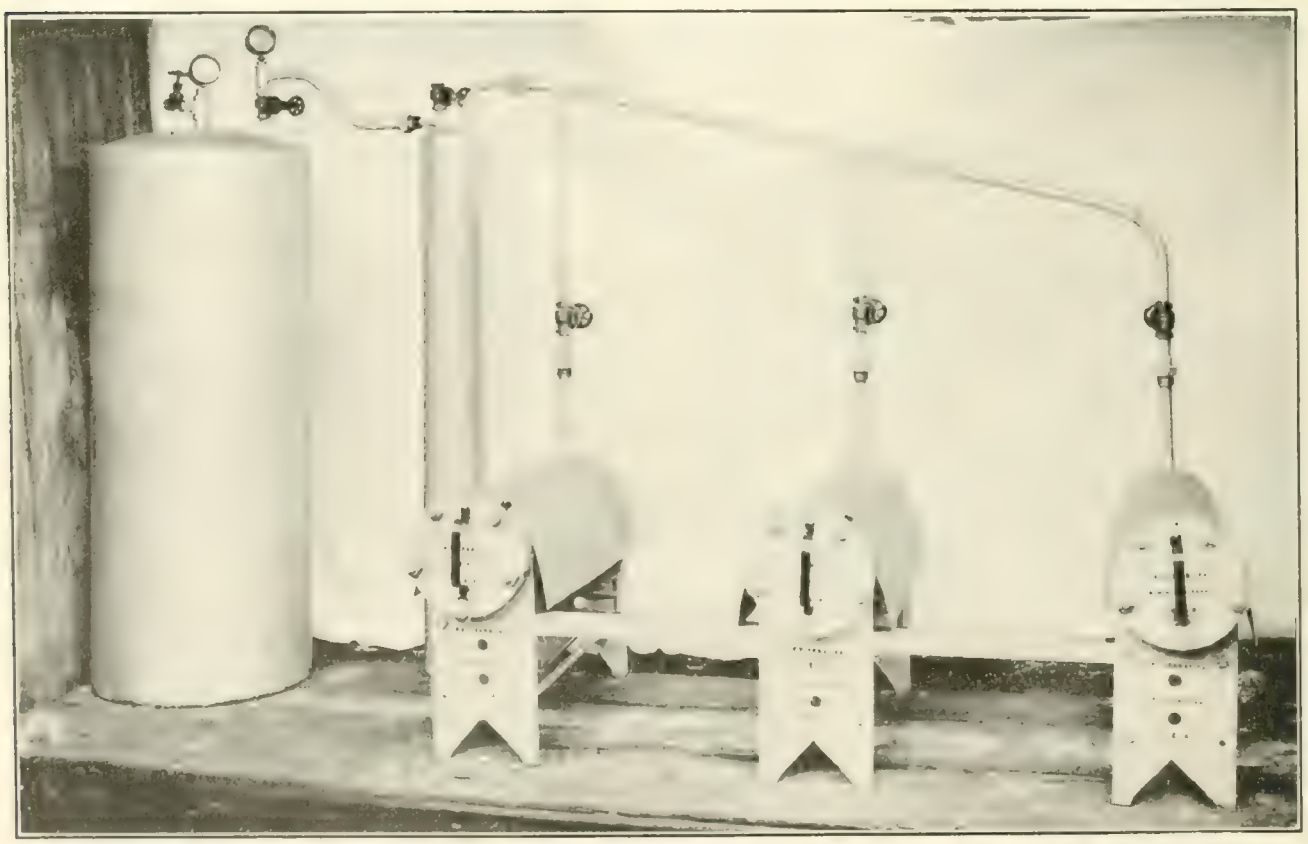


Fig. 1. Apparatus Used for Generating the Oxygen Gas and Forcing it into the Tank Under Pressure.

"autogeneous" welding. A long name that will probably not be used to any extent on account of the difficulty of pronouncing it. This company manufactures the apparatus for welding by this process as well as that for generating the gases. In Fig. 1 is shown the ap-

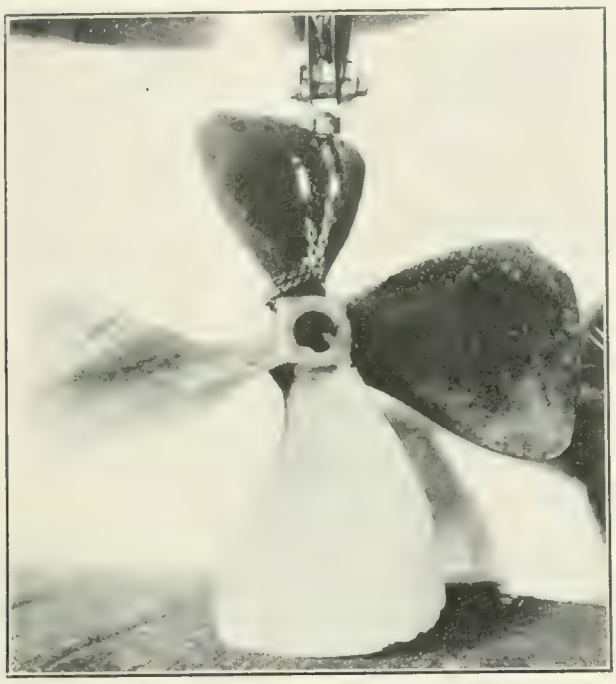


Fig. 2. Propeller With Blade Welded on.

paratus for generating the oxygen and the storage tank. The acetylene is generated and stored in another apparatus. It is made in the usual manner from calcium carbide.

Fig. 3. Hub of Bronze Propeller Filled by Melting in Metal by the Blowpipe.

The method of welding by the use of the oxy-acetylene blowpipe consists in an actual melting of the parts together or melting metal of the same kind in the joint. In Fig. 2 is shown a broken propeller blade welded by this company, and in Fig. 3 is the hub of a similar one of bronze filled up by melting in the necessary amount of metal in it. In Fig. 4 the effect of the blowpipe on a piece of

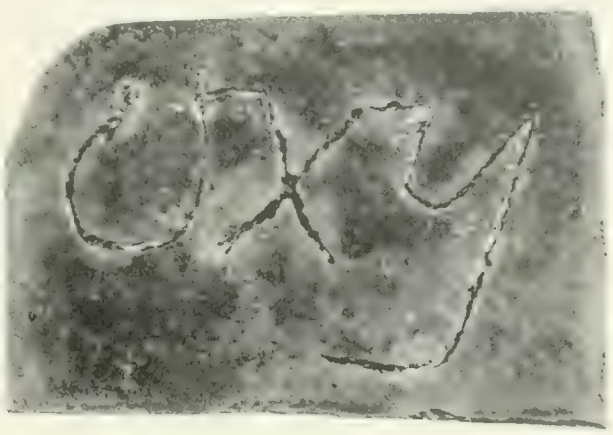


Fig. 4. Letters Cut Out by Oxy-Acetylene Blowpipe on a Piece of Boiler Plate.

boiler plate is shown. The name was actually melted out by it. The melting of steel and iron by the blowpipe is an easy operation.

Small steel goods, such as screws, rivets, studs, pins, etc., are blued by heating in a revolving furnace to the necessary temperature and then dumping into water or oil as may be desired.

Nickel plating solutions that are too strong are not advantageous as a slight drop in temperature causes the salts to crystallize on the anodes and sides of the tank. The solution should be sufficiently weak to avoid this.

The best bearing bronzes are those which are free from zinc and high in lead. When zinc is present, it seems to cause heating. The present high speed obtained in some of the large railroads has been made possible by the use of bearing bronzes high in lead.

Hydrofluoric acid is the best agent to use for removing sand from castings, particularly those of iron and steel, as it attacks the sand and dissolves it, while other acids attack the metal and only loosen the sand so that it falls off.

Questions and Answers.

QUESTION No. 746. Will phosphor-bronze stand the action of sea-water as well as manganese-bronze? We have some boat castings to make of phosphor-bronze (as the specification calls for) and fear that they will not resist the action of sea-water.

Answer. Our experience has been that phosphor-bronze, when free from lead, resists the action of sea-water equally as well as manganese-bronze. When it contains lead in a considerable amount, however, the sea-water seems to act on it more readily. With a small quantity of lead, say one or two percent or under, the action is not marked, but we advise leaving out the lead entirely.

QUESTION No. 748. Is there any method of obviating the large quantity of oxide of zinc fumes that is given off from a crucible of yellow brass when removed from the furnace without detriment to the metal? I am making plumbers' brass goods and use scrap for making them.

Answer. There is no method that is satisfactory for removing the fumes except to have a well ventilated foundry. In England a device is used for placing on the crucible when it is skimmed and to which is attached an exhaust pipe, but it is clumsy and far from satisfactory. It is not used at all in the United States. Many concerns that have installed the skimming tank (made by The Metal Dross Economy Co.) for recovering the metal from brass skimmings, report that their foundries are, comparatively speaking, free from smoke as there is no pile of skimmings to give off oxide of zinc fumes continuously. Skimming into the water avoids it.

QUESTION No. 749. How can fly specks be removed from old chandeliers?

Answer. If you desire simply to refinish the chandeliers by lacquering, and the specks are not deep, then the old lacquer and specks may frequently be removed by soaking in some lacquer thinner and the relacquering done at once. The fly-specks, however, particularly if of long standing, may have attacked the metal underneath. If this is the case, take the chandelier apart and remove the lacquer in hot potash. Then refinish by polishing or otherwise and lacquer. It often happens that the fly specks have penetrated so deep in the surface of the metal that much labor is required in polishing the chandelier to remove them, but it is the only method by which they can be removed. Always remove the lacquer first as previously described.

QUESTION No. 750. What is the best method of preserving the polished surface on plumbers' brass goods, such as faucets, cocks and valves, from tarnishing while in stock? We cannot afford to use lacquer, and while we have packed these fittings carefully away, wrapped with one thickness of paper, the tarnish rapidly appears.

Answer. If the goods are not placed in a room in which the atmosphere is corrosive, it is quite probable that the paper in which you wrap your goods is the cause of the tarnishing. Paper for use in wrapping metal goods should be specially prepared for the purpose as ordinary paper contains injurious chemicals which tarnish the metal. Paper is now manufactured for this purpose and may be obtained from the makers. All makers of polished metal goods use it, and it may be purchased in white or brown quality. If you still have trouble with the tarnishing after you use the non-tarnishing paper, look to your polishing compositions as there can be no other causes.

QUESTION No. 751. In my work I have to produce a bright, yellow gold deposit and cannot understand why I have so much trouble in producing it. Can you inform me what is required to produce a bright yellow gold?

Answer. In order to obtain a yellow gold deposit of a satisfactory color, the base metal upon which the gold is deposited should be of yellow brass. Unless an extremely heavy deposit is put on, you cannot obtain a good yellow color on copper or other red metal as the color of the base metal always affects that of the gold. In addition to this feature, you should use the right solution for gilding. The following is Roseleur's gold solution for this work and which is almost exclusively used by ormolu gold platers:

Water	1 gallon
Sodium phosphate	7½ oz.
Sodium bi-sulphite	1¼ oz
Potassium cyanide	⅛ oz.
Pure gold	2½ dwts.

The gold is first "cut-down" with nitro-muriatic acid and made into chloride in the usual manner and then added to the solution. It is run warm at about 120 degrees F. and the amount of current will have to be regulated to suit your work. This can be ascertained by a few trials. The color can be regulated by dipping the anode in the solution to a greater or less amount according to the desired shade.

QUESTION No. 752. How are aluminum shot made and for what are they used?

Answer. Aluminum shot are used in various chemical operations and in the so-called alumino-thermic method of reducing metals from their ores. The shot are only small grains of metal and are readily obtained by pouring the melted aluminum into water. The distance of the metal above the water and its heat determine the size of the shot. With cold metal held near the water the shot are small, but with hotter aluminum held a distance above the shot are more flattened and

larger. They are shot only in name as the pieces are not round and vary greatly in size.

Question No. 753. Does tin cause spring brass wire to crystalize in service? We have heard that brass mixtures without tin are better for spring metal.

Answer. It has been one of the beliefs of some of the brass manufacturers that tin in a spring brass mixture causes it to crystalize, but no accurate data has been obtained on the subject. The use of a small quantity of tin in the mixture certainly increases its value as a spring metal. Some manufacturers claim that a low brass consisting of 85% of copper and 15% of zinc with the temper drawn in it is the best spring brass for wire. Owing to the fact that tin raises the elastic limit of the brass, it produces an excellent spring mixture.

Question No. 754. What is the usual method of producing a satin-finish on silver plated steel and German-silver knives and forks?

Answer. The satin-finish on the silver plated ware is produced by a satin-finish brush. This is a wire brush similar to a scratch brush but is revolved at a higher speed. It may be obtained from all dealers in plating supplies.

Question N*. 755. What is the cause of aluminum castings cracking in the mold? We have been greatly troubled with the cracked castings and have lost many of them lately. We do not seem to overcome it.

Answer. The usual cause of the cracking of aluminum castings is the use of an aluminum alloy containing zinc. This mixture is the most difficult to cast and frequently will not show cracks until the machine work is put upon the castings. The best casting mixture is the aluminum and copper alloy. While it is possible to cast the aluminum and zinc mixture, the mold and core must be rammed "soft" and the metal poured at as low a temperature as possible.

Question No. 756. Can German-silver be silver plated without using the mercury or quick dip previous to plating?

Answer.. While it is possible to silver plate it without the use of the quick dip, it is unsafe and the deposit is apt to peel. The slight film of mercury that is put on the surface of the German-silver by the dip serves to bind the silver to it and prevents stripping. It is very unwise to attempt to dispense with it as it is not costly.

Question No. 757. Can you inform me if solder deteriorates with age. A bar of soft solder that I made some ten years ago from equal parts of pure tin (new metal) and new lead does not now give me good results. When used it seems to leave a coating similar to an oxide on the surface of the metal when melted, although I distinctly remember at the time it was made it melted free from oxide.

Answer. When solder is exposed to the air, particularly if damp, the surface oxidizes, and when melted this oxide floats on the surface. This is the cause of your difficulty. It may be said that solder actually deteriorates with melting as this oxide film somewhat injures it and prevents it from flowing freely.

Question No. 759. I have some steel stampings to re-plate. They have been copper plated, then oxidized and afterwards lacquered. How can I remove the lacquer and the oxidized copper?

Answer. First soak the stampings in a strong, hot potash or caustic soda solution to remove the lacquer. When this is done, immerse them in a strong cyanide solution made by dissolving one or two pounds of potassium cyanide in a gallon of water. If this is used warm, it works very rapidly, although it may be worked cold is desired. The oxidized copper surface is removed and the bare copper left. You may have to buff the copper after this operation, if you desire a smooth surface as the portions where the oxidized copper has been removed will be dead. The whole can then be re-plated. The cyanide solution will not have any effect on the steel.

Question No. 760. Can antimony be used on a soft solder containing tin and lead? If so how much is used? It is customary to add antimony to the solder?

Answer. Antimony is not added to soft solder. It is usually considered that it injures rather than improves it. Much of the soft solder on the market contains antimony, but it is not added intentionally. The solder is made from scrap metals which contain more or less antimony.

Question No. 761. Can a liver of sulphur solution be tested by the hydrometer in the same manner as an electroplating solution? We desire to make such a hydrometer test of our solution each day.

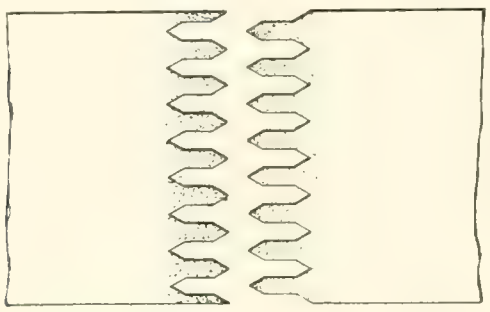
Answear. A hydrometer is not used upon a liver of sulphur solution. It should be made fresh quite frequently as it soon deteriorates. During warm weather it spoils rapidly and a new solution should be made each day. Liver of sulphur is cheap and there is nothing to be gained by using an old solution as it does not work satisfactorily.

Question No. 763. In plating cast-iron clock cases is the quality of the castings of importance, or is the surface obtained by polishing? Will an ordinary iron founder be able to make them?

Answer. The quality of the cast iron is not of so much importance as the quality of the molding, although it is necessary to use an iron adapted for the purpose. If not, the castings will not run well and the surface will be unsatisfactory for plating. As fine sand as possible must be used and the molding well done. The castings are preferably cleaned by a sand blast. The average iron founder neither has the quality of iron necessary for the work, nor the requisite skill in molding. A good iron casting is absolutely essential for such work.

Patent Abstracts.

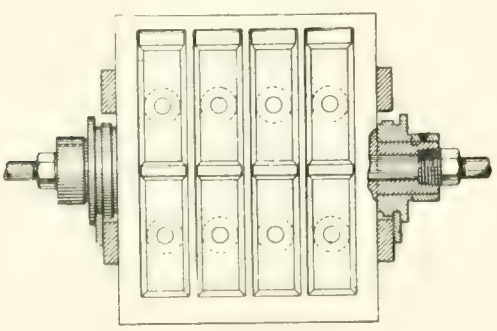
944,658, Dec. 28, 1909. BELT-JOINT. John C. Blevney of Newark, N. J. A method of cutting the joint in a strapping belt of emery or other abrasive cloth. The cloth is used for grinding and polishing metal goods



while passing over rapidly revolving pulleys. The ends are dove-tailed as shown and then fitted together, glued and pressed on a press to a flat surface. The object is to produce a tight joint and yet not have any ends to be torn up by the work. The ends of the dovetail are upon the back of the belt.

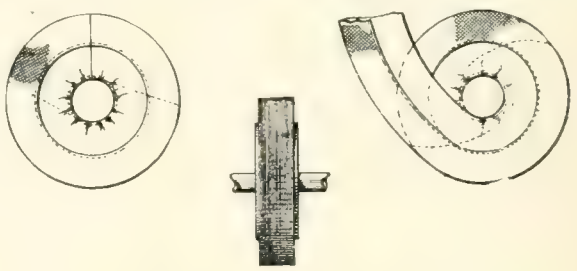
946,459, Jan. 11, 1910. FINISHING GALVANIZED SHEET METAL. Alexander Niedringhaus of St. Louis, Mo. In galvanizing sheet steel, imperfections are frequently caused by the adherence of particles of flux to the surface. These spots then continue to spread causing corrosion They are removed by a circular scratch brush revolved by power.

946,721, Jan. 18, 1910. INGOT CASTING MACHINE. George M. Clark of Nahant, Mass. This invention is a mold for casting soft metals. It is adapted more particularly to the recasting of type metals in ingot form. The mold is designed so that the ingots may



be easily removed and rapidly cooled in the mold after casting. The ingot mold is jacketed and water circulated through it to cool it. Suitable mechanism is also provided for clamping the mold to the side of the melting kettle from which the metal is forced into it.

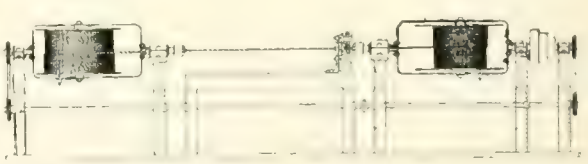
945,177, Jan. 4, 1910. BUFFING OR POLISHING WHEEL. Frank M. Levett of New York City. A buffing or polishing wheel made of cloth sections, and which are sewed together on lines extending outward at different angles at the center of the wheel. Pock-



ets are thus formed in the surface of the wheel which serve to hold the polishing or buffing composition. In this manner a uniform distribution of the composition is obtained, and at the same time less is wasted.

945,347, Jan. 4, 1910. MACHINE FOR TRIMMING BLANKS FOR SHEET METAL SHELLS. John H. Shiels of Wallingford, Conn. Assignor to the International Silver Co., of Meriden, Conn. The machine is designed principally for trimming the edges of sheet metal knife blanks after stamping. The halves are held in a jig and the edges planed in a machine similar to a shaper, but on a smaller scale.

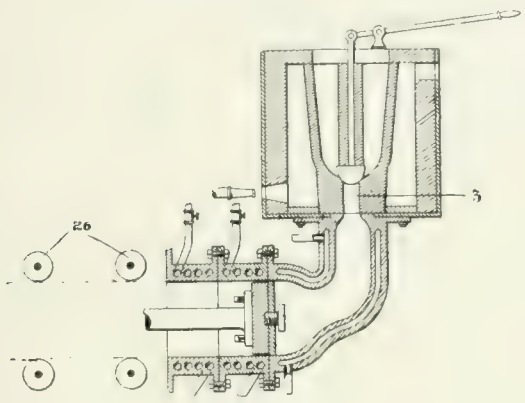
946,090, Jan. 11, 1910. MACHINE FOR ARMORING CABLES. Emil Witzenmann of Pforzheim, Germany. A machine for ar-



moring cables with metallic hose. The cable is fed from a delivery reel and a winding head winds the metallic tape along its surface as it is fed through to the winding reel.

946,645, Jan. 18, 1910. CORE MAKING AND SAND MOLDING MACHINE. Fred Penlington of Gorton, Manchester, England. The sand is rammed in the core box by a plunger operated by a lever, and a second lever serves to vent the core. It is then removed by a piston. The machine is principally adapted for core making in which large sizes are desired.

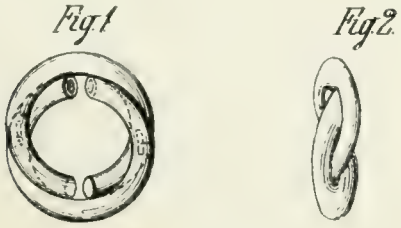
944,370, Dec. 28, 1909. PROCESS AND APPARATUS FOR MAKING METAL INGOTS. John F. Monnot of New York City. An apparatus for casting metal from the bottom. The metal is allowed to pass through a flux while the casting is taking place, and



which the inventor calls a "wiper". It is claimed that the metal is freed from dross etc., when it is done. The apparatus really consists of a basin which sets upon the top of the mold, and is supplied with a plug and stopper for allowing the metal to flow into the mold from the bottom.

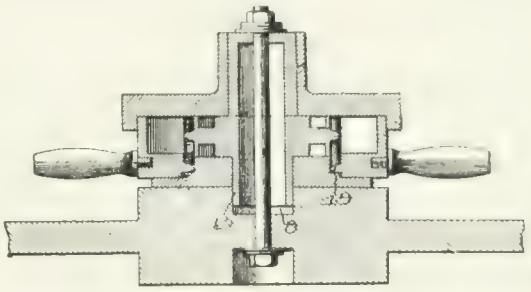
947,159, Jan. 18, 1910. MEANS FOR FORMING THE OPENINGS IN CASTINGS. Madison M. King of Albany, N. Y. A method of casting threads in castings. A threaded nut is inserted in the mold like a core and the metal flows around it and holds it in place. The nut is held in place by a suitable chaplet.

944,64, Dec. 28, 1909. PROCESS FOR SOLDERING CORD CHAINS. Karl F. Ungerer and Emil Becker of Pforzheim, Germany. The links are made of the wire cord and solder wire. The solder wire is pierced



at the point where it touches the plain wire. The links are then arranged in such a way that the gap of the solder ring lies at the top and the gap of the plain wire at the bottom. The whole is then heated so that the solder melts.

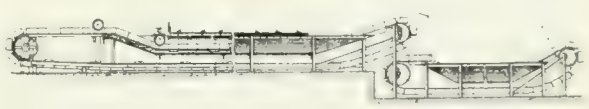
945,941, Jan. 11, 1910. APPARATUS FOR MAKING CORES FOR WORM GEARS. John A. Hallander of Ottumwa, Iowa. Assignor to the American Mining Tool Co., of the same place. A core box for making the



cores for molding worm-gears. The object is to make the core in one piece without joint so that the gear will require no machining. The core box is made in such a way that the worm is formed by partial rotation of the cover as indicated in the illustration.

946,192, Jan. 11, 1910. METHOD OF OBTAINING METALLIC ATTACHMENTS FOR INCANDESCENT LAMPS. Pierre Azaria of Paris, France. The soldering is carried out by passing an intense current through conductors of refractory material, placed near the point where the attachment is to be made. The soldering is then effected by the radiation.

945,024, Jan. 4, 1910. APPARATUS FOR RECOVERING MATERIAL FROM SCRAP METAL. Solomon W. Egbert of Joliet, Ill. An apparatus for recovering tin from tin plate scrap. The scrap is conveyed by a conveyor through a suitable electrolyte



in which the scrap is decomposed by the electric current and the tin is deposited upon a cathode. The feature of the invention is in the apparatus used and not upon the process of removing the tin from the scrap.

945,019, Jan. 4, 1910. CASTING INGOTS. Wm. H. Connell of Pittsburg, Pa. The ingots are cast by bottom-pouring with two gates so that the casting may be made compound. One kind of metal is poured through one gate and a second kind through the other. A special device on the surface of the metal serves to maintain the two kinds of metal in as separate a manner as possible.

Trade Items.

The Yale Novelty Co., of Leominster, Mass., manufacturers of inlaid combs and ornaments, have moved into their new building.

Smith Bros., of Providence, R. I., manufacturers of cheap jewelry, have moved to 4 Blount St., where a larger factory has been equipped.

It is reported that negotiations are under way for the amalgamation of the leading stove manufacturers in Reading and the Schuykill Valley into one large concern with a combined capital stock of from $4,000,000 to $5,000,000.

The A. F. Flanders Mfg. Co., has been incorporated in Buffalo, N. Y., with a capital stock of $30,000 to manufacture metal fixtures and metal novelties. Electroplating will also be carried on.

Joseph Bertrand is now the sole owner of the Capitol City Plating Works, North Pearl & Tivoli St., Albany, N. Y. Wm. F. Tanner, who was formerly associated with him in the firm, has retired. Jobbing electroplating of all kinds is carried on and a specialty made of architectural and church work.

The W. N. Best Calorific Co., of New York City, manufacturers of furnaces for heating and melting, have retired from business, and the business will be continued by W. N. Best personally. His office is at No. 11 Broadway. Mr. Best has had twenty-two years of experience in the equipment of furnaces with oil and tar burning apparatus and controls many patents in this line. He will continue to make a specialty of the same class of work.

The Wire Goods Co., of Worcester, Mass., manufactuers of wire goods of large variety, have acquired the wire goods department of the E. Jencks Mfg. Co., of Pawtucket, R. I. For the present the plant will be continued in Pawtucket, but it is expected that it will finally be moved to Worcester. The old name is still retained and a new concern, called the Jencks Knitting Machine Co., has been organized to conduct the knitting machine business. The E. Jencks Mfg. Co., are one of the oldest wire goods makers in the United States and have been in business for over fifty years.

At the annual meeting of the Bristol Brass Co., of Bristol, Conn., manufacturers of sheet, wire and rod brass and brass tubing as well as a large variety of other brass goods, the following officers were elected: President, treasurer and general manager, Julian R. Holley; assistant general manager, Alexander Harper; vice-president, Henry F. English; secretary, Samuel B. Harper. Directors, Henry F. English and Dean Welch of New Haven, Conn.; J. R. Holley, G. W. Mitchell, S. B. Harper, R. S. Newell, Chas. T. Treadway, all of Bristol; and Chas. W. Gross of Hartford, Conn. Albert F. Rockwell and Wm. S. Ingraham of Bristol were also elected as two new members of the board.

The Attwood Brass Co., of Grand Rapids, Mich., manufacturers of automobile hardware, are to install new polishing machinery.

The Oriental Metal Bed Co., 8th. and Clinton St., Hoboken, N. J., manufacture of brass bedsteads, are installing new equipment in their plant to replace that which was recently damaged by fire.

The Rome Scale & Mfg. Co., of Rome, Ga., recently increased their capital stock to $50,000 and are to build a foundry 50 x 50 feet. Platform and warehouse scales are manufactured.

The Tube City Air Spray Co., of Braddock, Pa., manufacturers of lacquer spraying devices, have moved to 309 Mayflower St., Pittsburg, Pa., and are now under the management of G. A. Urbach.

The Champlin & Norton Mfg. Co., has been incorporated at Plainville, Conn., with a capital stock of $10,000 to manufacture electric specialties. A factory will be obtained, but the location is not yet selected.

L. Fritsche & Co., of Newark, N. J., manufacturers of a line of gold rings and novelties, are soon to move to the Herpers Building on Crawford St. Their present factory has been purchased by the Pennsylvania R. R.

The Boston Clock Co., has been organized in Boston, Mass., with offices at 16 State St. They are identified with the Chelsea Clock Co., of the same address, clock manufacturers with works in Chelsea, Mass., and are marketing a similar line of goods.

The Connecticut Mfg. Co., recently incorporated in Waterbury, Conn., to manufacture small metal goods, are now located on Division St. Brass castings will be made and electroplating carried on. Outside work in this line will also be done. The officers are: Chas. H. Swenson, president and treasurer, and John Swenson, secretary. Charles H. Swenson is the general-manager. They have been identified with the plants of the former Holmes, Booth & Haydens Co., and the Benedict & Burnham Mfg. Co.

At the annual meeting of *The Institute of Metals* held in London, England, January 18th and 19th, the following officers were elected: President, Sir Gerard Muntz, Bart.; vice-presidents, J. D. Bonner, Prof. H. C. H. Carpenter, Prof. W. Gowland, F. R. S., Prof. G. K. Huntington, Vice-Admiral H. J. Oran, Sir. Henry Wiggin, Bart.; Members of the Council, T. A. Baylies, G. A. Boeddicker, Clive Cookson, J. Corfield, R. Kaye Gray, Summers Hunter, Dr. R. S. Hutton, J. T. Milton, G. H. Nisbett, E. Ristori, A. E. Seaton, Cecil H. Wilson, Prof. Thomas Turner, and W. H. Johnson. The Honorary Treasurer elected was Prof. Turner, and W. H. Johnson is the Honorary Secretary. The corresponding secretary is G. Shaw Scott, M. Sc., Caxton House, Westminster, S. W., London.

The brass foundry of Reel Bros., S. 2nd. St., Harrisburg, Pa., is to be sold.

The Winfield Electric Welding Machine Co., has been incorporated at Warren, Ohio, with a capital stock of $9,000 to manufacture an electric welding machine. The machine has been in use at the works of the Winfield Mfg. Co., for some time.

The American Tube Bending Company, Inc., have been organized at New Haven, Conn., to make automobile parts, etc. The factory is at Lawrence and Mechanic Sts. The organizers are H. S. Munson, J. H. Bradneck, and G. C. Munson. The capital stock is $10,000.

The American Ornamental Iron & Brass Co., recently organized in Milwaukee, Wis., are to erect a plant in Bryn Mawr, Minn. and will manufacture ornamental iron and bronze work, such as grilles, railings etc. The president of the company is Frederick H. Wallis and the secretary, Hubert Kelly.

The Hopson & Chapin Mfg. Co. of New London, Conn., iron founders and machinists, offer for sale their entire electroplating equipment consisting of dynamos, tanks, polishing jacks, brass and copper anodes, insulated wire, polishing wheels etc. Owing to the fact that they are not carrying on electroplating any longer, it is desired to dispose of the equipment.

Beer, Sondheimer & Co., 42 Broadway, New York City, sell ingot copper of all kinds, antimony, aluminum and aluminum alloys, spelter, zinc-dust, antimonial-lead and arsenic. They are also the selling agents for the National Zinc Co., of Bartlesville, Oklahoma. They are one of the largest concerns in the metal trade and have close relations with metal companies in Europe.

The Doehler Die Casting Co., Court & Ninth St., Brooklyn, N. Y., manufacturers of die castings, are sending to the trade a new catalogue of their products which they have just published. This catalogue is well illustrated and contains much information on the subject. The uses of their castings are described and a list of the different alloys used are given.Their product is cast ready for use and requires no machining whatever. Castings that heretofore have been expensive when machine work has been done upon them may now be purchased very cheaply.

Rock maple sawdust for cleaning, drying and tumbling metal goods is one of the products of the Lignum Chemical Works, Meeker Ave., and Van Dam St., Brooklyn, N. Y. They are also makers of boxwood sawdust for fine work. The sawdust of their manufacture is free from acids or other corrosive agents that will tarnish metal goods. One of the recent products of this company is leathermeal or pulp for tumbling metal goods. It is supplied in a very satisfactory form of a soft nature that may be used for polishing the finest goods. Samples of their products and particulars will be sent upon application.

The Racine Aluminum & Brass Foundry of Racine ,Wis., have moved into their new foundry. This plant is 40 x 100 feet and is equipped with modern appliances.

A new building 70 x 190 feet is being erected by the American Locomotive Co., at Providence, R. I., for use in the manufacture of their automobiles.

The new sheet metal factory of the Buick Automobile Co., at Flint, Mich., is nearing completion. It is 150 x 800 feet and it is expected that the installation of the equipment will be made in the early spring.

The Mitchell & Van Meter Co., manufacturers of plumbers' brass goods, are to build a new plant at 13th. and Cumberland Sts., Philadelphia, Pa. The general offices will then be located there and a new plating plant and brass foundry are to be equipped.

At a recent meeting of the Ideal Electric Co., of Mansfield, Ohio, the following officers were elected. President and treasurer, C. H. Voegele; vice-president, William Dow; secretary and general manager, S. Glen Vinson. The capacity of the plant is being increased by the installation of additional equipmnet. Electroplating dynamos and electric motors are manufactured.

At a recent meeting of the stockholders of the Bannatyne Watch Co., of Waterbury, Conn., manufacturers of medium-priced watches, the following officers were elected: President, Franklin Farrel, Jr.; treasurer, George C. Bryant; secretary, Archibald Bannatyne. Directors, Franklin Farrel, Sr., Franklin Farrel, Jr., George C. Bryant, Archibald Bannatyne and D. Austin Brown.

The American Oil and Supply Co., 52 Lafayette St., Newark, N. J., manufacture an exceptionally complete line of brass and steel brushes for platers and other metal workers. They also manufacture or carry a full line of tools and supplies for the electroplating, silver-smithing, manufacturing jewelry and other metal working trades. They issue a very complete catalogue of 600 pages describing the vast amount of goods carried by them. They also have offices at 143 Eddy St., Providence, R. I., and 1006 Heyworth Bldg., Chicago, Ill.

Roth Bros. & Co., Adams and Loomis Sts., Chicago, Ill., manufacture electrically driven polishing and buffing lathes for the plating and other metal trades. The advantage of their lathes over belt driven types is that any speed may be obtained to suit the case, and the lathe may be placed in any locality or position and is not dependent upon a line of shafting. They also manufacture a very extensive line of motors, dynamos and electrical machinery for a variety of work. The New York office is at 136 Liberty St., from which all the Eastern business will be looked after, and George F. Schminke, the manager will give the most careful attention to it. Their catalogue will be sent when desired.

Shaffer & Co, of Harrisburg, Pa., are to build a new brass foundry 100 x 120 feet for the manufacture of brass specialties for automobiles.

The capital stock of the Rockwell Silver Co., of Meriden, Conn., manufacturers of silver deposit wares, has been increased to take care of their increased business.

W. C. Fink of Elizabeth, N. J., manufacturer of sterling silver goods and novelties, is to transform his present building on Orchard St., into a tenement, and will erect a new factory in Roselle, N. J.

The American Thread Company of Willimantic, Conn., are contemplating the starting of an electroplating plant. They have some equipment that was purchased a number of years ago but which was never used, and will probably form the nucleus of the plant. The electroplating will be done upon parts of their own machinery.

One of the largest manufacturers of lacquer in the United States desires a good salesman to represent them in the Eastern States. This is a good opening for someone familiar with the metal trades and who desires to travel in this territory. Particulars may be obtained by referring to the Want Column.

The Vanadium Metals Co., of Pittsburg, Pa., producers of vanadium alloys, have purchased the plant and business of the Victor Metals Co., of East Braintree, Mass., and will operate it in the manufacture of vanadium bronzes and other vanadium alloys. Victor C. Lassen who has been with the Victor Metals Co., since its inception, and after whom the metals have been named, will remain as superintendent of the plant. The same high grade castings will be made as heretofore.

The next meeting of the American Foundrymens' Association, the American Brass Founders' Association, and the Foundry and Manufacturers' Supply Association will be held in Detroit, Mich., from June 6th. to 10th, 1910. The convention and exhibition will be held on the grounds and in the buildings of the Michigan State Fair Association. More than twice the space used at previous conventions will be required for the exhibits. The cost of space will be fifty cents per sq. foot. The Cadillac Hotel will be the headquarters of the allied associations. Further information will follow later.

A very successful meeting and dinner was held by the National Electroplaters' Association at the Hotel Marlborough, New York City on January 15th. A large number of members were present, and after an address of welcome by Dr. Richard Moldenke, addresses were made by Dr. W. A. Jones of the Celluloid Zapon Co., Percy S. Brown of the Western Electric Co., and S. D. Benoliel of the International Chemical Co. These addresses are printed in full elsewhere. The success of the meeing and dinner was largely due to the efforts of George B. Hogaboom of Newark, the Chairman of the Entertainment Committee.

The Canada Smelting Co., is now doing a gold and silver sweep smelting and refining business at 90 Terauley St., Toronto, Canada. The company was recently organized.

The Comstock-Wellman Bronze Co., has been incorporated in Cleveland, Ohio with a capital stock of $25,000. The incorporators are S. T. Wellman, F. S. Wellman, J. A. Wellman, C. W. Comstock and L. W. Comstock.

The Perfect Bibb & Faucet Co., of Upper Sandusky, Ohio, manufacturers of plumbers' brass goods, have purchased a factory on South Sandusky Ave., and will move their plant to that location.

A sixty ft. addition is being erected by the Wetherill Finished Castings Co. of Philadelphia, Pa., at their plant at Richmond and Erie Ave. The addition will be equipped with improved casting apparatus.

Homer N. Young, Bakewell Bldg., Pittsburgh, Pa., Attorney at Law, is now representing the owner of the R. H. Marshall patents for the simultaneous electrodeposition of silver and nickel, and will shortly establish the patent on the market. It is expected that the salts for the solution will be sold.

Ingot brass of high grade is made by the Riverside Metal Refining Co., of Connellsville, Pa. It is made from selected metals and is guaranteed to give satisfaction. The experience of this company in the manufacture of ingot metals has been extensive, and purchasers take no risk in placing orders with them.

The Swan & Finch Co., 151 Maiden Lane, New York City, are one of the oldest concerns in their line. They manufacture fish and whale-oil soap for the plating trades and also platers' compound. These materials have been used for many years in the electroplating industry and never fail to give satisfaction They are also refiners and dealers in lubricating oils and greases.

Owing to the death of John L. Merigold, Senior, of the firm of Merigold & Merigold of Newark, N. J., the name of the concern has been changed to the Merigold Electroplating Co. and will be continued by the surviving partner, John L. Merigold, Jr. The company will, as in the past, conduct a jobbing electroplating business and make a specialty of fancy colored gilding on jewelry and novelties. The location will remain at 97 Chestnut St.

The Hill & Griffith Co., of Cincinnati, Ohio, the well known manufacturers of foundry supplies, have just issued a new and particularly complete catalogue of foundry supplies and equipment. It is an extensive work of over 600 pages and illustrated with nearly 900 halftone plates and engravings. In addition to the extensive list of foundry supplies and equipment, a large amount of general foundry information is given. It is one of the most elaborate and useful catalogues that has appeared in the trade, and will be preserved as a work of reference as well as a catalogue.

C. Drucklieb, the well known manufacturer of sand-blasts and equipment, has moved his office from 132 Reade St. to 178 Washington St. corner of Dey St., New York City.

The brass foundry of the Stevens Point Foundry & Machine Co., of Stevens Point, Wis., has been increased so that they are now able to turn out a much larger amount of work.

The Newark Jewelry Mfg. Co., has been incorporated at 50 Columbia St., Newark, N. J., with a capital stock of $100,000 to manufacture jewelry. Adam F. Foster, Biagio Roberti, and Frank Orlando are the incorporators.

The Bliven Mfg. Co., has been organized at Putnam, Conn., to manufacture trolley fittings. A special trolley harp is to be one of the specialties. The head of the company is Percy C. Bliven of Danielson, Conn.

A new four story factory, 50 x 120 feet is to be erected by the Capitol Brass Works of Detroit, Mich. It is to be situated on the corner of Franklin and Cheney Sts. The contract has already been let.

The Twentieth Century Hinge Co., recently organized at Brookfield, Mo., to manufacture an adjustable hinge, will shortly commence manufacturing. A factory is to be erected later and a full line of hinges will then be made.

The Du Charme Wrench & Novelty Mfg. Co., of Johnstown, Pa., are fitting up a plant for the manufacture of a patent wrench and other hardware specialties. The wrench will be made under patents of Wm. S. Du Charme. An electroplating plant is to be equipped and all kinds of plating carried on.

A new brass foundry has been started by Crawford & McCrimmon of Brazil, Ind., manufacturers of hoisting engines, pumps and fans. Their product is used in the mining industry, and the brass foundry will make castings to be used on their own machines. It is stated that the foundry was started owing to difficulty having been experienced in obtaining satisfactory castings.

Purchasers or sellers of all kinds of metal drosses, turnings, chips, skimmings, grindings should obtain prices from J. L. Dolgoff of Bridgeport, Conn., before purchasing. When this is done, it will always result in satisfaction and ultimately business will follow. His connections in the metal trade are such that his facilities for handling large lots of material are unexcelled.

In the January issue of the *Obermayer Bulletin,* issued by the S. Obermayer Company of Cincinnati, Ohio, are the usual number of interesting articles upon foundry practice. During the year it will be published monthly instead of bi-monthly as heretofore. The Bulletin will be gladly sent to those who desire it and will always prove a welcome visitor. It may be obtained from any of the offices of the company.

The Machine Molded Brass Casting Co., have started to make brass castings by a special process at 285 South St., Boston, Mass.

The Standard Brass & Copper Tube Co., of New London, Conn., which have been in operation for a few months in the manufacture of brass and copper tubes, are now increasing their equipment. Seamless tubes are manufactured and five furnaces are operated in melting.

The United States Sherardizing Co. of New Castle, Pa. have started a new publication called the *Sherardizing Magazine* ("An Anti-Rust Periodical") and the first issue of which was mailed in January. It is a small booklet devoted to Sherardizing and contains much useful information on the subject. It will be sent to those interested. The publication is intended only to exploit Sherardizing.

The J. W. Beach Company, Housatonic Ave., and Stella St., Bridgeport, Conn., scrap metal dealers and refiners, expect to start a melting department, for the manufacture of brass and composition ingot, in the near future. They would be pleased to receive catalogues of furnaces and melting equipment for this purpose. This new department will be under the supervision of George S. Youngs.

The J. W. Paxson Company of Philadelphia, Pa., the well known manufacturers of foundry supplies and equipment, have opened a New England office and warehouse in Providence, R. I. This office will be under the supervision of Wm. T. Nicholson of that city and who was formerly connected with the Cutter, Wood & Stevens Co. It is expected that the complete line of Paxson equipment will be carried. Mr. Nicholson is familiar with the Eastern trade.

Personal.

James Savage has taken charge of the brass foundry of the F. I. A.T. Automobile Co., of Poughkeepsie, N. Y.

A. J. Vaughn has resigned his position as superintendent of the brass foundry and manufacturing plant of the Mitchell & Van Meter Co., of Pottstown, Pa., manufacturers of plumbers' brass goods.

Frederick N. Pease, who has been assistant chemist of the Pennsylvania Railroad at Altoona, Pa., has been appointed chief chemist to succeed the late Dr. Charles B. Dudley. Mr. Pease was the assistant of Dr. Dudley for many years and associated with him in many of the investigations carried on.

H. C. Flanigan has joined the technical staff of the Celluloid Zapon Co., of New York City and will look after the technical correspondence of the company. Mr. Flanigan has been connected with some of the leading concerns in Providence and Attleboro doing silver plating and coloring.

Current Metal and Supply Prices.

These Prices are net and are for moderate quantities. Smaller quantities command higher prices. Prices subject to fluctuation.

Acetone, pure, 98-99%	lb.	.22
Acid, Acetic, pure, 30%	lb.	.07
Acid, Arsenious (White Arsenic)	lb.	.20
Acid, Benzoic	lb.	.55
Acid, Boracic (Boric), pure	lb.	.12
Acid, Hydrochloric, see Acid, Muriatic.		
Acid, Hydrofluoric, 30%	lb.	.04
Acid, Hydrofluoric, 50%	lb.	.10
Acid, Muriatic, 20°	lb.	.02
Acid, Muriatic, c. p., 20°	lb.	.07
Acid, Nitric, 38°	lb.	.05⅝
Acid, Nitric, 40°	lb.	.05⅞
Acid, Nitric, 42°	lb.	.06¼
Acid, Nitric, c. p.,	lb.	.08
Acid, Sulphuric, 66°	lb.	.01¾
Acid, Sulphuric, c. p.	lb.	.06
Alcohol, Wood	gal.	.50
Alcohol, Denatured	gal.	.55
Alum	lb.	.04
Aluminum, Sulphate	lb.	.06
Aluminum, Metallic, in Ingots	lb.	.23
Aqua-Fortis, see Acid, Nitric.		
Ammonia Water (Aqua-Ammonia), 20°	lb.	.04¾
Ammonia Water (Aqua-Ammonia), 26°	lb.	.06¼
Ammonia Water, c. p.	lb.	.08
Ammonium Carbonate, lump	lb.	.15
Ammonium Chloride (Sal-Ammoniac)	lb.	.12
Ammonium Hydrosulphuret	lb.	.30
Ammonium Sulphate	lb.	.07
Ammonium Suphocyanate	lb.	.50
Amyl Acetate	gal.	1.85
Antimony	lb.	.08½
Arsenic, Metallic	lb.	.15
Arsenic, White (Acid Arsenious)	lb.	.20
Argols, White (Cream of Tartar)	lb.	.31
Asphaltum, Commercial	lb.	.05
Asphaltum, Egyptian (Bitumen)	lb.	.30
Benzine	gal.	.15
Benzol, Pure	gal.	.75
Bismuth, Metallic	lb.	1.75
Bitumen, see Asphaltum.		
Blue-Vitriol, see Copper Sulphate.		
Borax, Crystals or Powdered	lb.	.10
Borax Glass	lb.	.35
Cadmium, Metallic	lb.	.70
Carbon Bisulphide	lb.	.10
Calcium Carbonate (Precipitated Chalk)	lb	.10
Chrome-Green	lb.	.50
Copper, Lake, (carload)	lb.	.14
Copper, Lake (cask)	lb.	.14¼
Copper, Electrolytic (carload)	lb.	.13¾
Copper, Electrolytic (cask)	lb.	.14
Copper, Casting (carload)	lb.	.13⅝
Copper, Casting (cask)	lb.	.13⅞
Copper Acetate (Verdigris)	lb.	.35
Copper Carbonate, dry	lb.	.25
Copper Sulphate (Blue-Stone)	lb.	.09
Copperas, see Iron Sulphate.		
Corrosive Sublimate, see Mercury Bichloride.		
Cream-Tartar, see Potassium Bitartarate.		
Cryolite	lb.	.12
Cyanide, see Potassium Cyanide.		
Dextrin	lb.	.15
Emery Flour	lb.	.04
Emery, F F & F F F	lb.	.03
Flint, powdered	lb.	.01
Fluor-Spar	lb.	.01¼
Fusel-Oil	gal.	1.75
Gold Chloride	dwt.	.60
Gum Copal	lb.	.30
Gum Guiacum	lb.	.26
Gum Mastic	lb.	.70
Gum Sandarac	lb.	.35
Gum Shellac, brown	lb.	.50
Gum Shellac, white	lb.	.60
Iron Perchloride	lb.	.25
Iron Sulphate (Copperas)	lb.	.05
Lead Acetate (Sugar of Lead)	lb.	.15
Lead, Pig	lb.	.04¾
Lead, Red	lb.	.12
Lead, Yellow Oxide (Litharge)	lb.	.12
Liver of Sulphur, see Potassium Sulphide.		
Manganese, Ferro, 80%	lb.	.10
Manganese, Metallic, pure	lb.	.75
Magnesium, Metallic	lb.	1.50
Mercury Bichloride (Corrosive Sublimate)	lb.	.93
Mercury, Metallic (Quicksilver)	lb.	.52½
Mercury Nitrate	lb.	1.50
Mercury Oxide, yellow	lb.	1.80
Nickel and Ammonium Sulphate (Double Salts)	lb.	.16
Nickel Carbonate, dry	lb.	.60
Nickel Chloride	lb.	.50
Nickel Metallic	lb.	.40
Nickel Sulphate (Single Salts)	lb.	.25
Nitre (Saltpetre), see Potassium Nitrate.		
Oil of Vitriol, see Acid, Sulphuric.		
Paraffine	lb.	.15
Phosphorus, yellow	lb.	.40
Phosphorus, red	lb.	1.10
Pitch	lb.	.05
Plaster of Paris, Dental	bbl.	4.00
Platinum Chloride	oz.	14.50
Platinum Metallic	oz.	29.00
Potash-by-Alcohol, in sticks	lb.	.50
Potash, Caustic (Potassium Hydrate)	lb.	.08
Potassium Bichromate	lb.	.14
Potassium Bitartarate (Cream of Tartar)	lb.	.31
Potassium Carbonate (Pearlash)	lb.	.10
Potassium Chlorate	lb.	.15
Potassium Cyanide	lb.	.25
Potassium Iodide	lb.	2.25
Potassium Nitrate (Nitre or Saltpetre)	lb.	.10
Potassium Permanganate	lb.	.17
Potassium, Red Prussiate	lb.	.60
Potassium, Yellow Prussiate	lb.	.24
Potassium Sulphide (Liver of Sulphur)	lb.	.15
Potassium Sulphuret, see Potassium Sulphide.		
Potassium Sulphocyanate	lb.	.70
Pumice, Ground	lb.	.05
Quartz, Powdered	lb.	.01
Rosin, Yellow	lb.	.04
Sal-Ammoniac, see Ammonium Chloride.		
Sal-Soda, see Sodium Carbonate.		
Silver Chloride, dry	oz.	.75
Silver Cyanide	oz.	1.00
Silver, Fine	oz.	.51½
Silver Nitrate, crystals	oz.	.50
Soda-Ash	lb.	.05
Sodium Biborate, see Borax.		
Sodium Bisulphite	lb.	.15
Sodium Carbonate (Sal-Soda), crystals	lb.	.02
Sodium Hydrate (Caustic Soda)	lb.	.05
Sodium Hydrate (Caustic Soda) by Alcohol (in sticks)	lb.	.45
Sodium Hyposulphite ("Hypo")	lb.	.04
Sodium Metallic	lb.	.90
Sodium Nitrate	lb.	.05
Sodium Phosphate	lb.	.09
Sodium Silicate (Water-Glass)	lb.	.04
Soot, Calcined	lb.	.15
Spelter, see Zinc.		
Sugar of Lead, see Lead Acetate.		
Sulphur (Brimstone), in lump	lb.	.05
Tin Chloride	lb.	.43
Tin, Metallic	lb.	.32½
Turpentine, Venice	lb.	.35
Verdigris, see Copper Acetate.		
Water, Distilled	gal.	.15
Water-Glass, see Sodium Silicate.		
Wax, Beeswax, yellow	lb.	.45
Wax, Carnauba	lb.	.70
Whiting (Ground Chalk)	lb.	.02
Zinc Carbonate, dry	lb.	.19
Zinc Chloride	lb.	.12
Zinc, Sulphate	lb.	.06
Zinc (spelter)	lb.	.06½

THE

BRASS WORLD

AND

PLATERS' GUIDE

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English Phosphor-Bronze.

Although many new and stronger alloys have made their appearance within the past fifteen or twenty years, more phosphor-bronze is now used than ever and the future will undoubtedly find even a greater quantity made. The reason for its extensive use is not the length of time that it has been known, but for the fact that it is a good casting alloy and is not subject to the cracking, shrinkage or a dirty surface found in manganese-bronze and similar mixtures. In other words it is a *safe* alloy. While it is not as strong as some of the other bronzes, it can be cast with great uniformity, and if allowance is made for its slightly deficient strength, the engineeer will feel sure that he can depend upon it.

Much poor phosphor-bronze is made, and while *legally*, perhaps, any copper and tin alloy containing a small or large quantity of phosphorus would be classed as a "phosphor-bronze", in reality there should be some definite specification for it so that one might know whether he is obtaining a satisfactory mixture. There is probably no copper alloy so little understood by brass founders and about which so much erroneous information exists.

About the only specifications in existence in our own country for phosphor-bronze are those for bearings, and many of these are the result of early belief and not facts. The English Admiralty specification for a phosphor-bronze for strength is as follows:

Copper	90.0 %
Tin	9.7 %
Phosphorus	0.3 %

In an investigation conducted by A. Philip in 1908, it was found that, in order to obtain a tensile-strength of 38,000 lbs. per sq. in. (17 tons) and an elongation of not less than 20% in 2 inches. the mixture should come within the following limits:

Copper	90.0% to 92.0%
Tin	0.7% to 7.4%
Phosphorus	0.3% to 0.6%

In connection with the making and use of phosphor-bronze, it is one of the most common errors of the average brass founder to use zinc in it. When it is done, not only is the strength reduced but much less phosphorus must be used, otherwise the bronze is actually injured and blowholes, large or small, will be present in the castings. It has been found that all the phosphorus that can be used in a bronze containing zinc is from 0.01% to 0.02%. Anything above this amount results in inferior castings. It should be one of the fundamental rules of metallurgy that a true phosphor-bronze mixture should *not* contain zinc.

Obstacles in Brazing Yellow Brass.

Instances are constantly coming up in which difficulty is experienced in brazing yellow brass and a few suggestions on the subject may serve to explain why it occurs. A correspondent recently wrote as follows:

"We have had occasion to braze some yellow brass rod, made into sleeves, into copper pipe, and with any spelter solder we have on hand, are unable to braze it. There is evidently a spelter solder made for this purpose for the reason that we obtain yellow brass tubing that has been brazed."

The question is one of the yellow brass mixture. In order to braze yellow brass successfully it must be made of a mixture adapted for the purpose and contain sufficient copper to raise its melting point above that of the solder to such an extent that it will not melt or soften during the brazing operation.

The mixture generally employed for the so-called "spelter-solder" for brazing is equal parts of copper and zinc. Yellow brass rod as now made contains from 62 to 64 per-cent of copper so that the melting point of the rod and the solder are not sufficiently far apart to allow brazing to take place without the softening of the brass rod. For successful brazing it has been found that the yellow brass should not contain less than 70 per-cent of copper and more is preferable. As now made, brass tubing that has been brazed contains about 72 per-cent of copper. Some makers use 75 per-cent. It is called "low-brass" and is brazed with the half and half spelter-solder. It contains so much more copper than the brazing solder that it does not melt or break during the brazing operation.

The question of brazing yellow brass, then, resolves itself into having sufficient copper in it to keep its melting point far above that of the brazing solder, and experience has demonstrated that it should contain between 70 and 80 per cent. If less is employed, there is always danger of failure.

Arsenic in Brass Plating Solutions.

The only object of adding arsenic to a brass plating solution is to produce a bright deposit that does not require buffing. It is a mistaken idea, however, that the deposit obtained by the use of arsenic is as bright as one that is buffed. It is not. It gives a bright deposit, to be sure, but it is not a buffed one. It has more of a "dipped" brightness than otherwise. The advantage of arsenic in a brass solution lies in the fact that for cheap work the deposit can be left without buffing, thus cutting the cost down, or allowing a very thin deposit to be used that would not stand buffing.

Platers are now and then found who use arsenic in their brass solutions although the work is buffed. One was recently found who was plating automobile levers with a three or four hour deposit and yet used arsenic in his solution. The levers were always buffed and it is, perhaps, needless to say, he experienced more difficulty in maintaining his solution in good condition that he would have done had he dispensed with the use of arsenic.

Arsenic had better be left out of a brass solution if the work is to be buffed, as it will serve only to render the solution more or less "freaky". The less the number of substances in a plating solution, the easier it is to manage, and as arsenic is used simply to produce a bright deposit, there is no advantage in using it when work is to be buffed.

The Gating and Pouring of Manganese-Bronze.

By W. R. Dean.

Now that manganese-bronze castings are being made in many foundries, where heretofore only a few attempted to make them, it has occurred to me that I might be able to help some brass founders out of their difficulties by giving a few illustrations and hints on the gating and pouring of this metal. I have been connected with a foundry that has successfully cast manganese-bronze for at least fifteen years, so that I have had an opportunity to study its properties quite thoroughly.

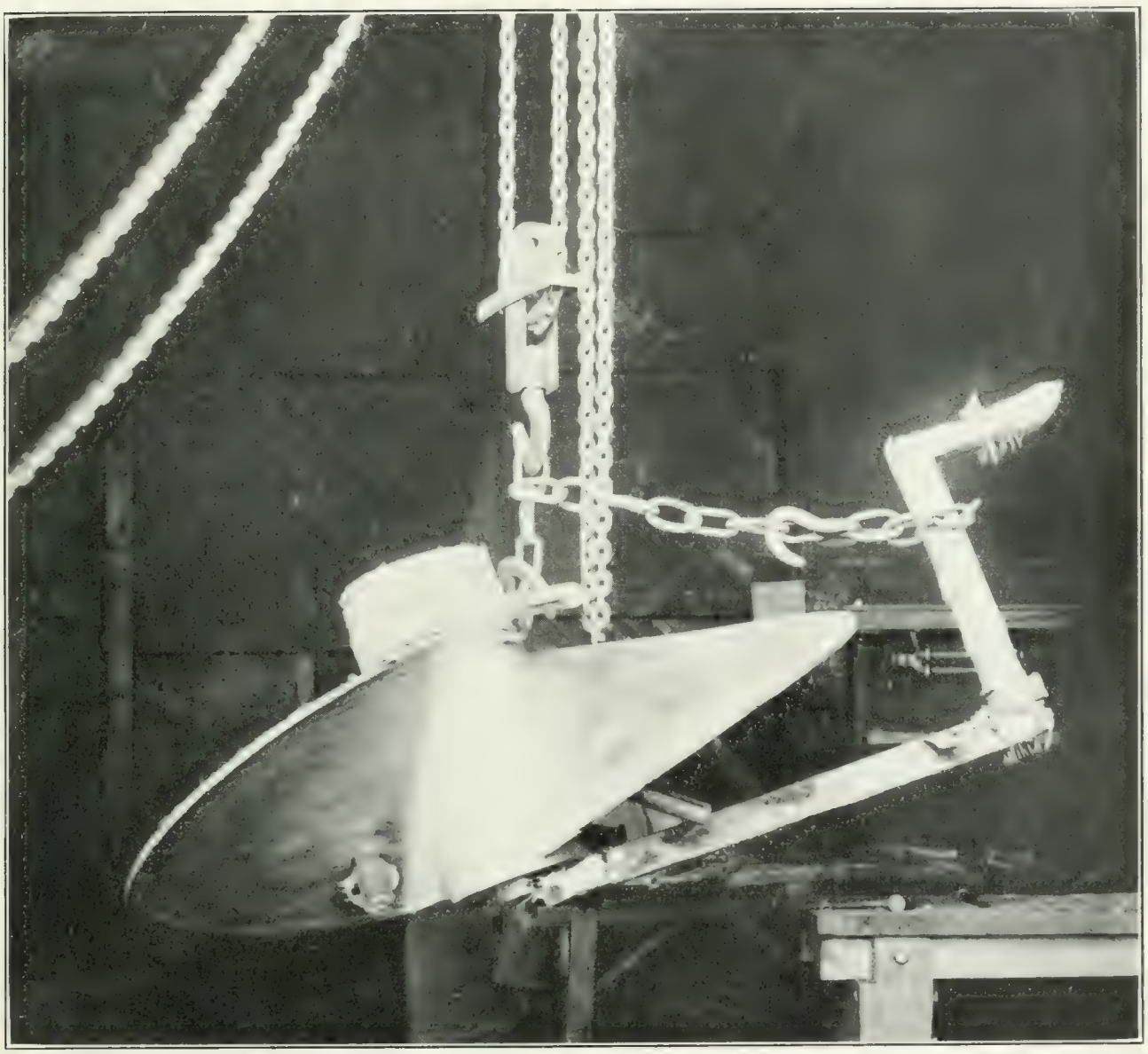


Fig. 1. Manganese-Bronze Propeller, Weighing about 1 Ton and Showing Method of Using Horn Gate and Casting Test-Piece. Nails for Retaining Dross are also Shown.

After using manganese-bronze for a few years, one comes to look upon the metal as no harder to gate than any other, but to the beginner it is the hardest of all. Aluminum-bronze might come under this heading for like manganese-bronze, it is also known as a strong bronze and has an excessive shrinkage. It is this excessive shrinkage which causes the trouble in casting it.

Give a molder, new to manganese-bronze, a pattern and tell him to put on a good, big gate. Say nothing else and watch the result. He will, no doubt, place the gate in the same place that would be used for brass with the exception of possibly making the gate heavier.

After the casting has been made, saw off the gate and notice the large shrink hole under it. Now to overcome such a difficulty, one has to study the properties of the metal and pattern, and after experience has been obtained, it is a simple matter to know what to do so that the molding becomes a sort of second nature. It may be said, however, that even with experience gained by practice, one is apt to err now and then.

Fig. 2. Shrink-Ball and Method of Placing It.

The reason that manganese-bronze has come into extensive use is because of its strength and cheapness. It is used where strong tin bronzes were formerly employed.

Gating for Loose Work.

In gating a pattern for casting manganese-bronze, the first thing to be understood is what goes on during the cooling process. The thin parts cool first and draw from the heavy parts, then come the heavy parts drawing from the still heavier, or the gate, so that it is necessary to have a large gate to feed the castings. If the size of the sprue or gate does not have to be taken into consideration, it can be made large enough and be heavier than the casting, or a shrink-ball may be put in to act as a reservoir for the casting. In Fig. 2 such a shrink-ball and method of placing it are shown.

I have one objection to a shrink ball and prefer a riser instead. Manganese-bronze contains so much zinc that the casting is apt to be drossy at the gated portion unless some sort of a skim-gate is used. To use a skim-gate frequently means too much expense and a brass founder cannot always add such extra cost in these days of competition. When the metal is poured at the most desirable temperature, very little dross enters the casting, but some appears when it is poured a little too hot, or quite hot, as it often must be in order to run very thin portions of the casting. Some means are necessary to take care of this dirt.

As the dirt or dross always rises to the top of the metal, a large riser placed on the way from the pouring sprue to the casting, will cause it to collect in it and prevent its entrance to the casting. The riser should be as near the casting as possible so as to remove all of

Fig. 3. Casting without Riser, Showing Dross.

the dross or dirt. In Fig. 3 is shown a casting gated without a riser and containing dross which found its way in. In Fig. 4 a riser and manner of placing it are shown.

It is often necessary to place a riser on a casting. When a heavy part is encountered which cannot be fed by a gate or a riser outside, it is imperative that the riser be placed

directly upon the heavy portion of the casting itself. In Fig. 5 such a riser on the heavy part of the casting is shown.

Before I go any further I wish to explain about churning. Manganese-bronze should be churned unless the casting is very small, there

Fig. 4. Method of Placing a Riser on the Gate.

are small parts, or it is gated. Use an iron rod for keeping the riser open as long as possible and churn it up and down. Hot metal is then poured into it as it cools. By churning

Fig. 5. Method of Placing a Riser Directly on a Casting.

the production of a sound casting is more certain and the riser need not be as large. Take for example, Fig. 6, a small propeller. If this casting had not been churned there would have been a shrink-hole in the hub after the riser had been cut off. A large sprue cannot be put on in a case of this kind to hold the casting up, and it is necessary, therefore, that the riser should be churned. In Fig. 7 a casting is shown which has a shrink-hole in it. After the riser had been cut off this was found. It was caused by the use of too small a riser without churning.

It is frequently impossible to place risers on a casting on account of its size and shape. In this case, they are placed around the outside and the casting is fed as it cools. In Fig. 8 a sketch of such a casting is shown together with the manner of placing the risers so that it will be properly fed as it cools. I was called upon to make some castings of this shape some time ago, and found that such a method of gating gave good results.

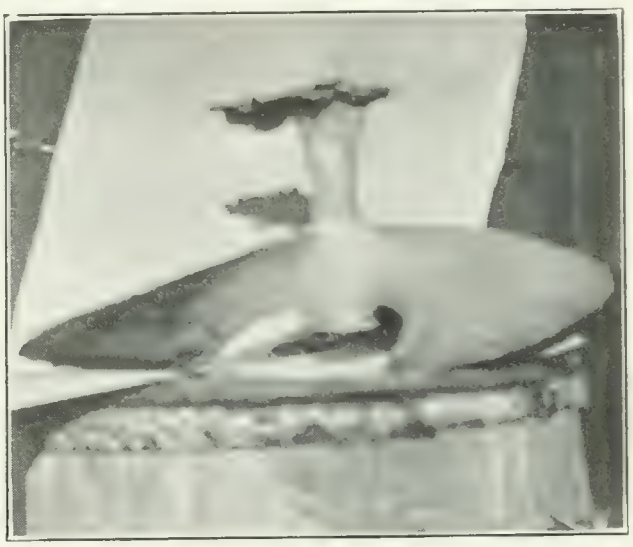


Fig. 6. Showing How a Small Riser May Be Used If "Churned."

These rings, shown in Fig. 8, were poured from one sprue, and poured hot and hard so that we made the whole of them without trouble. There were two kinds: The lighter weighed only 29 lbs. while the heavier weighed 45 lbs. They were not more than half an inch thick on the rim and about 2 feet 11 inches in diameter. The pattern was mounted on a board which served as a match-plate. The pattern was flat, making a blank cope to ram and the casting all came in the drag.

Use of the Horn Gate.

In gating loose work, every kind of a piece has to be gated in a different manner. For small bench work the use of a horn sprue is unnecessary, while for large work made upon the floor it is the best method of gating. There are many kinds of castings which can be gated

in a far better manner with a horn sprue than with any other kind. Take, for instance, the casting shown in Fig. 9. Here a horn gate is the right kind. If a straight gate had been used, the teeth in the casting would have been apt to come drossy. The gear was not to be machined and as clean a casting as possible was wanted. The use of the horn gate brought about this condition.

For large work, a horn gate is very essential, particularly when propeller or propeller blades are to be made. In Fig. 1 a type of horn gate used in casting such large work is shown. The propeller shown in the illustration weighed about 1 ton. Attention is called to the cope portion where the metal was poured. It will be noticed that nails were put in to catch the dirt and the metal ran through a trough. This

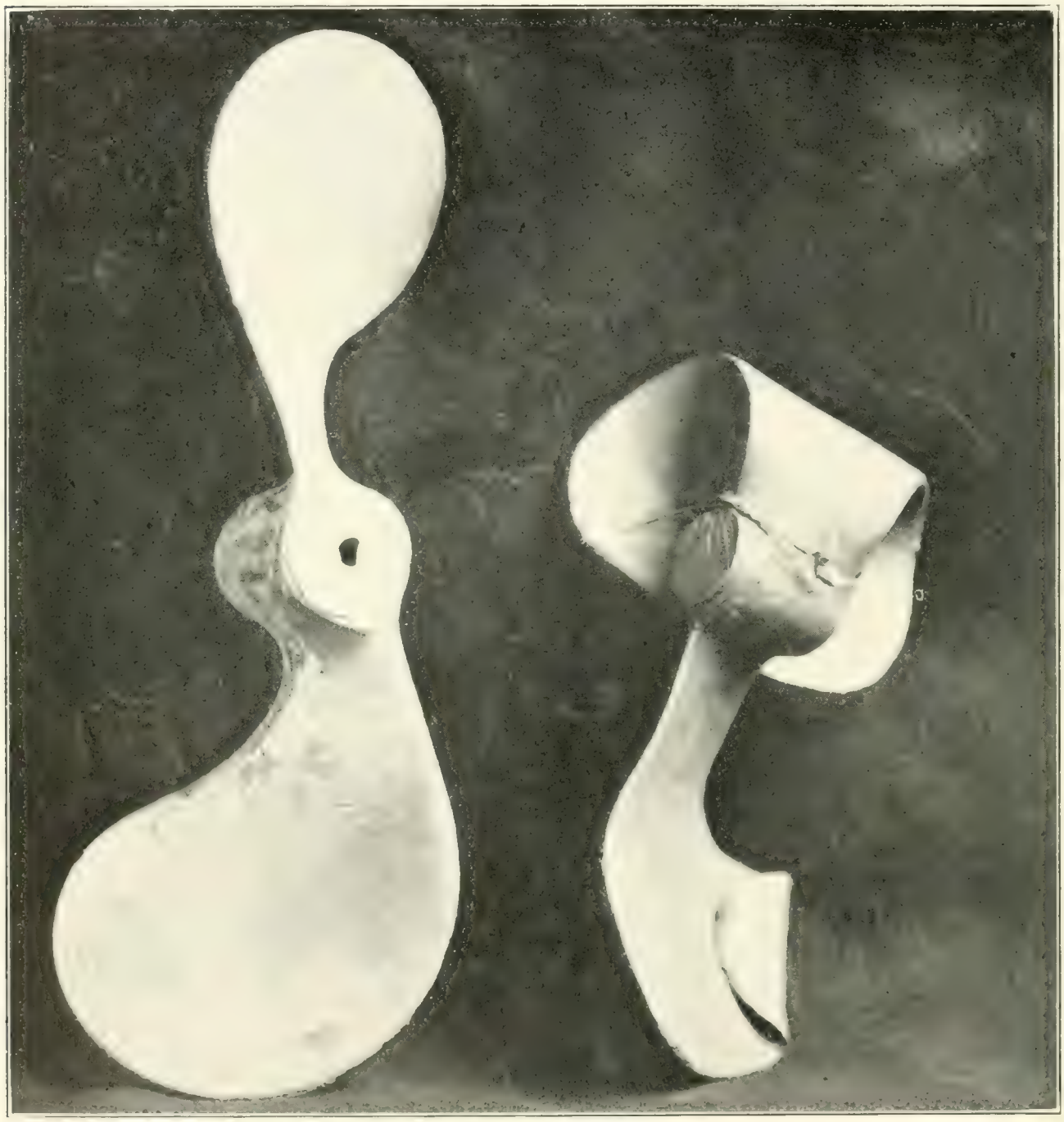


Fig. 7. Manganese-Bronze Propellers. The One at the Right Shows Toughness of the Metal. The One at the Left has a Shrink-Hole Under the Riser Caused by Use of Too Small Riser.

Notice the riser on the gear casting shown in Fig. 8. The pattern was cored out so that the riser had to be placed in semi-circle shape. The riser to this casting was churned five or six minutes while cooling to render it sound.

propeller was poured from a tilting ladle, such as used for iron and the manganese-bronze was melted in a reverberatory furnace. When using a ladle, a large amount of metal is exposed to the air and dross is formed rapidly. The

nails were put in to catch as much dross as possible. Others were also used at the bottom of the sprue where the gate is connected to catch what escapes from the first lot.

In Fig. 1, on the left hand side of the casting, a small projection will be noticed cast on to the propeller. This is the test piece. The propeller was to stand a certain test. There is also a test piece on the riser.

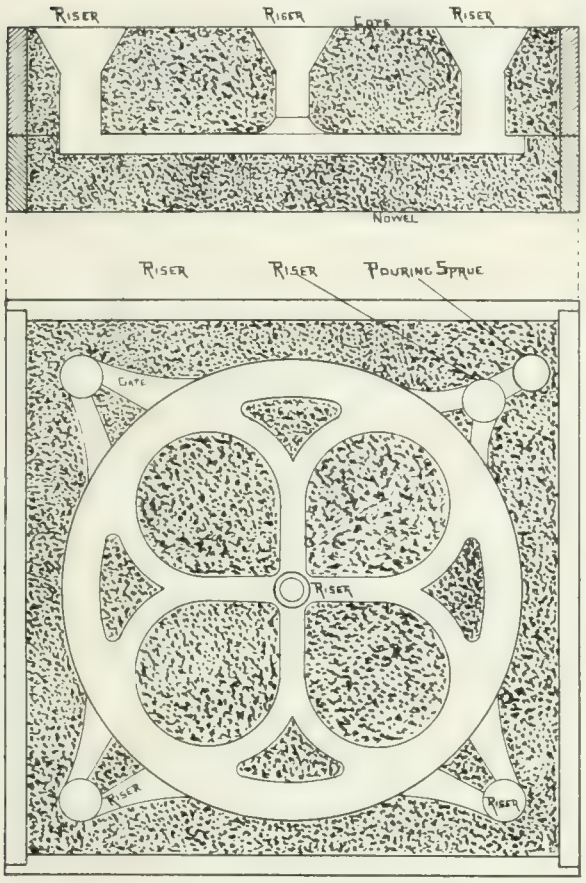


Fig. 8. Sketch Showing Manner of Gating a Large, Thin Casting.

Notice the size of the riser. It was necessary to have it so large in order to keep the propeller from shrinking. The riser had to be churned and about two hours are necessary in churning before the casting has cooled and a sufficient amount of hot metal has been poured in to compensate for the shrinkage.

In gated work, where no riser is used to catch the dirt and dross, some other means should be provided, and I have adopted the method shown in Fig. 10. This dirt-catcher is cut in the cope and runs along the main gate. It is stopped short before reaching the end, and in this way all the dirt rises in this gate and is checked before entering the casting.

Manganese-bronze is a very tough metal and can be used in a large number of instances to a better advantage than any other metal. A casting may be made many times lighter than when made of other metals. The casting at the

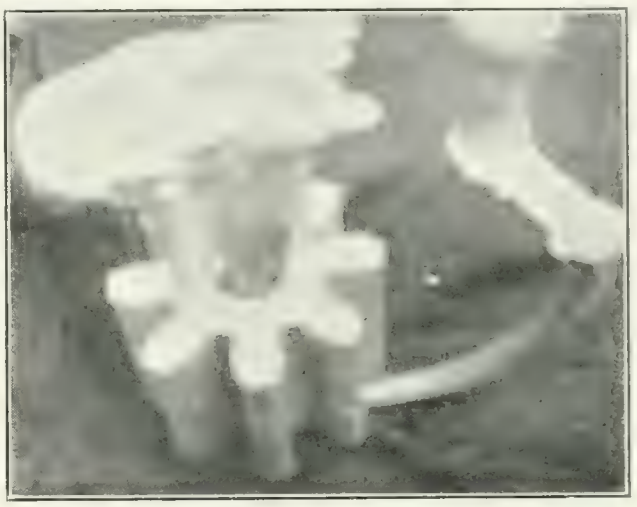


Fig. 9. Method of Placing a Riser When a Core Interferes.

right hand side of Fig. 7 shows the pounding that manganese-bronze will stand before breaking. By varying the proportion of zinc in the metal, it can be made hard or soft. At its best

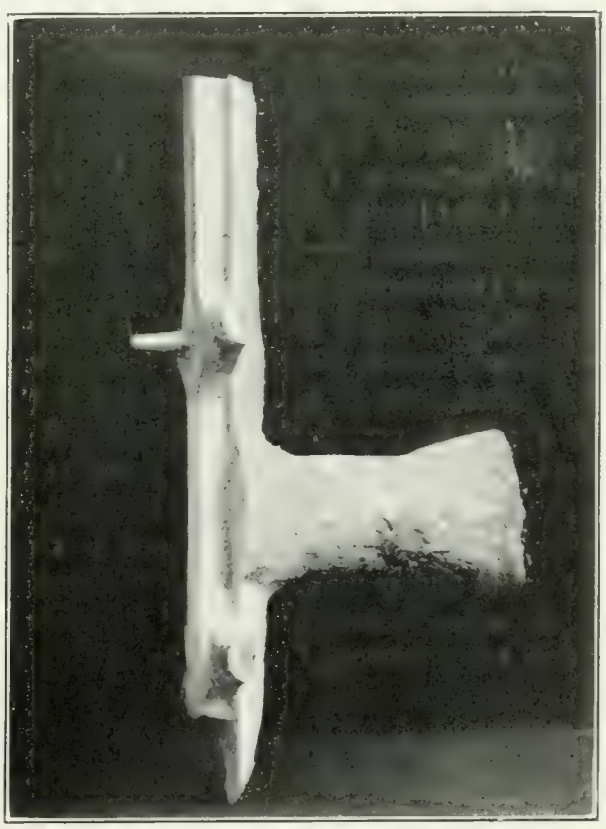


Fig. 10. Dirt-Catching Riser Used on Gated Work

it may be straightened or bent while cold, although a heavy load is necessary for the purpose.

In summing up the gating of manganese-bronze, I desire to impress the necessity of heavy gates and runners, risers on the heavy parts of the casting, and the practice of churning the riser while cooling. It is absolutely essential that the casting be fed by a big gate-reservoir (shrink-ball) or riser, and in the case of heavy castings, that they be churned. Wherever there is a part to the pattern particularly heavy, put on a riser. Sometimes one may be put on where it is not needed and it is always better to have too many than too few. It is easier to cut off an extra riser than to make the casting over. Sometimes by leaving off a riser a shrink-hole may not show up until the casting has been machined, hence much time is wasted for the want of a suitable riser.

Pouring the Bronze.

Manganese-bronze should be poured fairly cool. The best pouring temperature is when the metal flares slightly when disturbed by an iron skimmer or stirrer. Sometimes very thin castings are made and in this case the metal should be smoking hot. The temperature may be varied from smoking hot to just a flare according to whether the castings are thin or not. When the metal is poured hot it will not test as high, as considerable zinc is then burned out.

In melting the metal, do not let it "soak" in the fire or remain too long. It melts rapidly when once started and should be poured the minute it begins to smoke. Allow it to remain a minute longer and it is burned. When burned, manganese-bronze is spoiled for work requiring high tensile strength.

It is often necessary to "burn-on" a piece of manganese-bronze to a casting that has not run or has other flaws in it. When doing it the metal should be very hot. It cannot be made too hot. By this, of course, is not meant to let it burn while melting. In this respect it should be appreciated that manganese-bronze is a peculiar metal and requires careful and constant study in order to overcome all of its properties that are a source of trouble in casting it.

Plaster of Paris may be made to harden more rapidly by the use of 0.25 per-cent of sodium bisulphate in it. It should be dissolved in the water used for adding to the plaster. At the same time the strength of the hardened mass is increased nearly threefold.

Agitated Plating Solutions.

Much hue and cry has been made within the past few years about the enormous advantage of agitated plating solutions, and it has resulted in an accompanying agitation of the plating trade. Many platers, who are always active to grasp a n w idea, think it is one of the necessary improvements in the plating room.

Allow us to suggest that it will be found advisable to look into the matter before adopting it. There are many instances in which it will fall short of producing the desired results. Like all new ideas, time discloses bad features as well as good ones.

In an acid copper solution which, by the way, was the first upon which agitation was used, it has been found excellent and is extensively employed. It allows a very high current density to be used and with the accompanying rapidity of deposition. As far as can be learned, there is no objection to its use. In nickel solutions it is also used with both good and bad results. In order to use it successfully in this instance, the solution must be kept as free of iron as possible and in a normal condition. Filtering is stated by some to be unnecessary, while others believe that it must be done.

In the cyanide solutions, agitation is the least desirable as it serves to expose the solution to the air and results in aeration and decomposition of the cyanide. It is of far less importance in a cyanide plating solution than in other instances previously mentioned.

Theoretically, an agitated solution is correct, and when properly conducted is capable of producing excellent results, but one should first find whether it is really necessary and whether it is capable of improving the work. As far as cyanide solutions are concerned, the best form of agitation is that which takes place by moving the work which is being plated as it is done in silver plating flat-ware. The solution is then less disturbed, and bubbles of gas on the work are removed and the solution is constantly mixed.

The addition of 2% of metallic sodium to lead hardens it so that it may be used for bearing surfaces. The alloy also is hard enough to ring when struck.

Notes on French-Bronzing.

On many of the solid bronze articles imported into this country from France and Austria, and known as French and Venetian bronzes, is found an orange yellow color that is quite beautiful. It is much lighter than the well known Barbedienne finish and is used upon statues, statuettes and similar solid bronze goods. The color is really a light brown with a faint orange tint. In the illustration is shown a small statuette imported in large quantities into this country from abroad and made of solid bronze. It had this light color.

The color is readily obtained on bronze goods and the formula for doing it is not new although not widely known. Slight mention has been made of it in various books on the coloring of metals, but in such a manner that one has usually paid little attention to it. The recently created demand for French-bronze goods has brought the attention of the plating trade to it.

To produce the color on solid bronze goods is simple. A highly polished surface is neither necessary nor advisable as it does not give as good an appearance as one with more of a dead lustre. A scratched brush surface is excellent. The surface must be freed from every trace of oil or grease in order to give an even surface when the coloring is done. Slight traces of oil or grease cause stains and a color that lacks uniformity. When the grease and oil have been removed, the article is immersed in a solution of cyanide in water containing about 1 lb. of cyanide in a gallon of water. It is used cold. The object of this operation is to remove any stain or discoloration that may have been formed during the cleaning. After this has been done, the article is thoroughly rinsed in water and then immersed in the following solution:

Water	1 gallon
Copper sulphate	1¼ oz.
Potassium chlorate	1½ oz.

The water is heated nearly to boiling and the copper sulphate and potassium chlorate dissolved in it. Both should be commercially pure. The C. P. materials are unnecessary. The solution has a bluish-green color.

When the article is first immersed in the solution, it begins to take on a brownish color of an iridescent nature. This afterwards becomes darker and finally the whole surface is colored. When this occurs, which takes about five minutes, the article should be taken out, rinsed, dried and scratch-brushed (dry) with a brass scratch-brush. Unless this is done, the color is apt to be uneven. After the scratch-brushing has been completed, the article is again immersed in the solution and allowed to remain for a short time. The color now darkens. When the desired color has been obtained, the article is removed, rinsed and dried, after which it is dry scratch-brushed.

Bronze Statue Made in France and Colored by this Process.

The true lustre of the surface is then obtained. By leaving the article in the solution for some time, say half an hour or more, and scratch-brushing and returning at frequent intervals, a sort of greenish-color is obtained that is pleasing, but not as good as the yellow shade obtained by a short treatment. Usually from five to ten minutes are all that are required to produce the desired shade.

It often happens that the scratch-brush, after the final color has been obtained, will leave a sort of dirty appearance on the surface and produce an "off-color" look. In this

case, after scratch-brushing, return the article to the solution for a second and the dirty surface will immediately disappear and the true color is then brought out. Then rinse and dry but do not scratch-brush again. The article is then lacquered or waxed as may be desired.

The solution works the best on solid bronze, and when it is used a light brown color with an orange shade is obtained. On copper it produces a darker tone that is quite pleasing. On solid, yellow brass an even lighter tone is obtained than that formed on bronze, and it does not take as readily. Yellow brass requires a longer treatment and more frequent scratch-brushing to bring out the desired even color. Rapid work on yellow brass gives a spotted appearance.

The solution may be used on plated goods, such as copper or bronze plated spelter, antimonial-lead or iron articles, but when it is used for such work, the deposit must be very heavy in order to avoid its removal in the solution. It should be borne in mind that the solution attacks the metal slightly, and unless of good thickness, it may be partially removed, particularly in the deep portions of an article when a deposit does not "throw" well. When a good, heavy deposit of metal is put on an object, there is no reason why equally as good results cannot be obtained as with solid bronze or copper goods.

The solution should be used in a stone-crock, enamelled iron kettle or other substances not attacked by the solution. Iron vessels, of course, will not answer. Porcelain dishes will answer for small work, and stone crocks, heated by a sand or water bath will have to be used for larger operations.

As the result of an investigation in the electrodeposition of nickel, Woolsey McA. Johnson found that the curling up of a heavy deposit of nickel is caused by the presence of a nickel hyrdide formed by the occlusion of hydrogen gas.

Dip gilding is far less employed than formerly, as it has been found that the electrodeposition of the gold gives more uniform results. For gilding pins, screws, nails and similar small articles, the dip gilding process is still used to some extent.

Correspondence.

The Relative Hardness of Pure Metals.

Editor:

In the February issue of THE BRASS WORLD, page 52 I notice a reference to the metal tantalum. There is a general misunderstanding in regard to the hardness of this metal. In its pure state it is not very hard, even when cold. Sometime ago I made some investigations upon the hardness of various metals, and among those tested, manganese stands first. The list is as follows:

Relative Hardness.

1. Manganese,
2. Molybdenum,
3. Cobalt,
4. Chromium,
5. Tantalum,
6. Iron,
7. Nickel,
8. Copper,
9. Platinum,
10. Silver.

All of these samples were perhaps as pure as could be prepared. The manganese, molybdenum and chromium were reduced by aluminum. The cobalt and nickel were in the form of sheet, and the tantalum in the form of wire about 1 millimeter in diameter. The tantalum wire seemed to contain some very hard substance which would persistently scratch glass. This was possibly an oxide or nitride of the metal. It does not seem possible that it was a carbide, since the metal is reduced by the action of sodium on the tantalo-fluoride of fluoride and afterwards melted in a vacuum by a high tension electric current.

The hard particles in the tantalum metal seem to be exceedingly small, but they evidently exceed quartz in hardness. The carbide of tantalum is very hard and this fact has given the impression that the pure metal itself is possessed of great hardness.

Elwood Haynes.

Kokomo, Ind.

A matt or dead surface may be produced on yellow brass in three ways: First, by the dead-dip. Second, by the sand-blast. Third, by a satin-finish wheel. The sand-blast is the best method and is more extensively used than any other.

The Management and Analysis of Silver Plating Solutions in Germany; and the Use of Barium Cyanide for their Regeneration.

By B. Wenzelmann.

The object of this article is to enable the silver plater to control and analyze his cyanide silver solutions in person without being compelled to invoke the assistance of a professional chemist. Besides this, it is important for every possessor of silver solutions that he be able, on the occasion of his yearly stock taking, to find out the exact weight of the silver contained in them.

Every practical plater knows that the work does not terminate with the preparation of the silver solutions. They are subject to continual chemical changes which take their origin in part in the action of the electrical current, and in part in the susceptibility for rapid decomposition of the aqueous solution of the potassium cyanide. In addition, the presence of carbonic acid gas in the atmosphere is continually changing the *top layers* of the silver solution into potassium carbonate and hydrocyanic acid. Although a plater can form an idea of the chemical changes of the solution by observing the appearance of the anodes and the work that is being plated, it does not indicate that he can ascertain exactly what to do to restore the solution to good working order when it becomes cold or needs attention. Now in order to eliminate all and any empiric experimenting, and to enable a plater to have at all times a clear knowledge of the chemical composition of his silver solutions, he should not shun the trouble of going to work according to the following indications:

Silver solutions that are prepared by means of the double cyanide of silver and potassium* must be tested as to their contents in:

1. Chemically pure silver.
2. Combined potassium cyanide.
3. Free potassium cyanide.
4. The whole potassium cyanide.
5. The potassium carbonate.

To Determine the Silver.

To effect this, the following operations are required:

1. Take 10 c. c. of the solution from the plating tank and pour into an ordinary beaker.

2. Add 20 c. c of pure water to it and then 10 c. c of ammonium sulphide. A black precipitate of silver sulphide is formed. The solution is allowed to settle for half an hour, and then a few drops more of the ammonium sulphide are added to see if all of the silver has been precipitated. When no more is thrown down, the glass is put one side and the contents allowed to settle for a few hours.

3. The clear liquid which has then formed on top is cautiously poured off, and the remaining drops of liquid sucked off by means of a piece of blotting or filter paper.

4. Repeat the pouring on of water, the settling and the sucking off a second time until the last traces of the liquid no longer turn red litmus paper blue.

5. Pour 20 c. c pure nitric acid on the black deposit in the glass and warm on a water bath or in any other desired manner. A hot plate may also be used. Bring to a boil and vapors will form in the glass. The boiling is continued until the formation of vapor has ceased and the particles of silver sulphide have dissolved.

6. Remove the glass from the water bath or hot plate and add 50 c. c. of pure water and 10 drops of a strong solution of iron alum.

7. Fill a burette up to the 0 mark with a 1/10 solution of normal ammonium sulphocyanate and place the beaker containing the dissolved silver under it and allow the solution to drop into it. Stir all the time with a glass rod. The moment the solution shows a pink tint, stop.

8. Now read the figure on the burette to which the ammonium sulphocyanate has fallen. Suppose the pink color has been reached at the figure 16.1. Then this figure multiplied by 1.08 gives the weight in grams of the pure silver contained in 1 litre of the solution. In this particular instance it would be 17.4.

It is now an easy matter to convert the metric figures into gallons and pennyweights. The relative values are as follows:

1 litre= 0.26418 gallons.
1 dwt.= 1.56 grams.

*In Germany, the silver cyanide is used for making up a silver plating solution, while in the United States silver chloride is generally employed—*Editor.*

The 1/10 normal ammonium sulphocyanate is made by dissolving 7.6 grams of this substance in 800 c. c of distilled water. It is of the highest importance, however, that this solution should be correctly adjusted. The following operations are necessary to ascertain it:

1. With a clean file, file off exactly 0.2 grams of *chemically-pure* silver from sheet or wire that may be obtained and known to be pure, and place in a beaker like that previously used.

2. Add 10 c. c. of nitric acid (equal parts of water and C. P. acid) and heat until the silver has dissolved and no more fumes are given off. This usually takes about 5 minutes.

3. Remove the glass from the water bath or hot plate upon which it has been heated and add 10 drops of a strong solution of iron alum in water (or a saturated solution).

4. Fill a burette up to the 0 mark with the solution of ammonium sulphocyanate to be tested, and place the beaker under it as before.

5. Allow the solution from the burette to drop in to the silver solution slowly, stirring all the time with a glass rod, and until a decided pink color has been given the solution that does not disappear upon stirring.

6. The solution in the beaker will then have assumed a pale pink color which is permanent and indicates the end of the operation.

If the end reaction occurs when the figure on the burette is at 18.4, the solution is right and may be used for the regular determination of the silver. If not, more or less of ammonium sulphocyanate will have to be added to the solution previously made up to adjust it. It is usually unnecessary with pure ammonium sulphocyanate.

Additional Method for Silver.

The amount of silver in a silver plating solution can also be determined after a method based on weight. To this effect the manipulations described under No. 1 and No. 4 are to be repeated. This produces a black precipitate of silver sulphide. After this the following operations are necessary:

1. Place the black precipitate on a small watch crystal (which has previously been weighed) and put on a sand bath to dry out.

2. Now weigh the crystal with the dry precipitate and the difference between the two weights will give the weight of the silver sulphide. Suppose the weight of the silver sulphide is 0.3352 grams, then this weight, multiplied by the figure 87 indicates the weight of the pure silver contained in 1 litre of the silver plating solution. In this particular instance it would be 29.16 grams.

To Determine the Combined Potassium Cyanide.

This is found by multiplying the amount of the solution of ammonium sulphocyanate used (in c. c.) in the determination of the silver, by the figure 0.65. In this instance the product would be:

$$16.1 \times 0.65 = 10.465.$$

That is to say, 1 litre of the solution contains 10.465 grams of combined potassium cyanide.

Determination of the Free Potassium Cyanide.

1. Put into a beaker or ordinary water tumbler, 1 c. c. of the silver plating solution to be tested, dilute with 200 c. c. of pure water and stir thoroughly with a glass rod.

2. Fill a burette up to the 0 mark with a 1/10 solution of normal silver nitrate. This is made by dissolving 17.5 grams of chemically pure silver nitrate of 63.5 per-cent in 1 litre of distilled water.

3. Place the glass referred to in No. 1 under the burette and allow the solution of silver nitrate to drop slowly from the latter into the glass. Stir with the glass rod. The solution of silver nitrate is allowed to drop in until a slight, bluish turbidity is formed which does not dissolve on stirring.

4. Suppose that this bluish precipitate or turbidity has appeared when the solution of silver nitrate has reached the point 6.5 on the burette. Then this figure 6.5, multiplied by 13, gives the weight of the free potassium cyanide contained in 1 litre of the silver plating solution. In this particular case, consequently, 84.5 grams.

To Determine the Total Potassium Cyanide.

By adding the combined potassium cyanide contained in 1 litre to the free potassium cyanide in 1 litre, the sum will be the total amount of potassium cyanide contained in the silver plating solution.

To Determine the Potassium Carbonate.

Potassium carbonate is the final product of the chemical decomposition that occurs in the silver plating solution, and contributes to the

concentration of the bath. *It also causes the silver deposit to become rough, especially on the sharp edges and prevents its firm adherence.*

The chemical process of determining the weight is a tedious one, but the following simple method may be recommended:

1. Take 10 c. c. of the silver plating solution and place in an ordinary test-tube.

2. Dissolve some barium cyanide in water in the proportion of 20 grams of barium cyanide and 100 c. c. of water.

3. Allow the barium cyanide solution to drop into the test tube. A white precipitate of barium carbonate forms. Note how many drops are required until no more white precipitate forms. From this it is easy to calculate how much of the solution of barium cyanide of the same strength must be added to the silver plating solution to convert all of the potassium carbonate into barium carbonate.

The use of barium cyanide in the removal of the potassium carbonate from a silver plating solution, and its consequent regeneration, has the advantage that potassium cyanide is again formed which dissolves and no foreign salts enter the solution. A precipitated barium carbonate is formed which may be allowed to settle or filtered off. If it is a matter of correcting a solution used for silver plating that does not work properly, then the amount of potassium carbonate must first be determined, and then converted with barium cyanide into potassium cyanide and the insoluble barium carbonate. After this, one analyzes the solution for potassium cyanide when it is seen that no further addition of potassium cyanide to the solution is needed.

After the analysis for potassium carbonate and potassium cyanide, proceed to analyze for silver after one of the two methods previously mentioned. If it is now shown that there is not enough silver in the solution, then it is best to add silver cyanide to it.

It now remains to be calculated how much silver cyanide must be added to obtain a stated weight of chemically pure silver in 1 litre of solution. As commercial silver cyanide is frequently adulterated, especially when it is the product of the reclaiming of old silver solutions, it is necessary to ascertain the percentage of chemically pure silver in the silver cyanide in question. This may be done in the following manner:

1. Dissolve 20 grams of silver cyanide in 1000 c. c. of water and sufficient cyanide to take it up.

2. In order to determine the amount of chemically pure silver contained in this litre, one proceeds in exactly the same manner as described for the determination of the amount of silver contained in the solution used for plating; i. e. Take 10 c. c. from the solution of silver cyanide just prepared and carry out as before. If the amount of ammonium sulphocyanate in the burette has fallen to 16.1, for instance, this is to be multiplied by 1.08 and the product (17.4) means that 20 grams of the silver cyanide in question contain 17.4 grams of pure silver. In other words, the silver cyanide contains 87.5 per-cent of pure silver.

Let it be assumed that a silver plating solution of 250 litres is to be corrected and the analysis has shown that 1 litre of it contains 17.5 grams of silver, and that the silver cyanide to be used to enrich it is of 87.5 per-cent silver. If it is desired that a litre of the silver plating solution shall contain 30 grams of pure silver, then the 250 litres must contain a total amount of $250 \times 30 = 7.5$ kilograms of pure silver. According to the analysis, the solution contained, before correction, $250 \times 17.5 = 4375$ grams of pure silver. Consequently 7500 less 4375 = 3125 grams of silver that must be added to it to bring up to the desired strength in silver. Since according to the aforesaid analysis the silver cyanide is 87.5 per-cent, it is really necessary to add 3785 grams of this silver cyanide to the solution in order to obtain the desired weight of 30 grams of silver in a litre of the silver plating solution.

Purifying Tantalum.

According to a method recently discovered by E. Weintraub of the General Electric Co., of Schenectady, N. Y., tantalum may be purified by electrolysis. The impure tantalum, which has been reduced from its oxide or other compound is made the anode in a bath of molten potassium tantalum fluoride. The cathode used is one of pure tantalum.

A refractory vessel is necessary for holding the fused salt and this may be made of magnesium oxide or tantalum if desired. By passing the current through, a relatively pure tantalum is deposited and the impurities left.

The Cost of Polishing and Nickel Plating.

By Charles H. Gibbs.*

As an answer to the article in THE BRASS WORLD, February, 1910, page 65 by J. E. Pfleuger on "The Cost of Electroplating", I beg to submit the following facts as the results of observation and experience:

With a nickel plating tank 6 x 2x 2 feet supplied with a 150 ampere dynamo, and with one man occupied with filling and taking out, we find that we deposit $3.00 worth of nickel per day. Add to this amount the wages of the plater at $3.00 and the amount is increased to $6.00 per day regardless of the cost of cleaning the work to be plated, the power, insurance, taxes, rent, light, heat, etc. It will be readily appreciated that a concern that charges from 40 to 50 cents per hour for nickel plating is losing money. We figure that to make a net profit of 20 per-cent, it is necessary to receive $1.00 per hour for nickel plating or any other kind of plating. Electroplating is very deceptive when it comes to calculating the cost. It should be remembered that the nickel deposited on the work costs a great deal more than the nickel in the anodes for the reason that pure nickel is plated on the work and there is considerable waste on racks, wires, etc.

As far as polishing is concerned, we find that all heavy work, such as roughing-out and buffing with a 16 inch buff-wheel, will consume very nearly 10 horse-power. Figuring this at the very lowest estimate of 2 cents per horse-power per hour, the cost for power would be $2.00 per day. If the polisher's time is taken at 30 cents per hour, the cost is then increased to 50 cents per hour, to say nothing of the emery, glue, etc., and not taking into account the overhead expenses for light, heat, taxes, insurance, rent, deterioration, etc. So that taking it all in all, our experience has been that to make a reasonable profit, a concern conducting a plating department must receive $1.00 for the work. There are some exceptions, of course, in which the work can be done for less, and there are times when it costs more.

We should like to hear from others regarding the cost of electroplating, as we have been in the business for twenty-five years and cannot figure a profit unless we receive $1.00 per hour for polishing or plating. The item of overhead expense (which is considerable in a plating department) is invariably overlooked by people in the business. Mr. Pflueger is quite right in his statement that many platers are not sufficiently familiar with the plating room to arrive at the cost of running it. If those engaged in the business would attack the problem properly, and ascertain the actual cost to them of plating and polishing it would open their eyes. We were forced to it because the matter of plating many thousand pieces was brought up upon which a hundredth of a cent each, one way or the other, would have made quite a difference.

As far as the actual amount of nickel on electroplated work is concerned, it is the opinion of the writer that 4 lbs. of nickel in the anode will not deposit over 1 lb. upon the work that is being plated.

*Secretary of The Buckeye Mfg. Co., Canton, Ohio.

New Books.

PATTERN MAKING, By G. H. Willard, with Chapters on Core-Making and Molding by F. D. Crawshaw of the University of Illinois. This is an excellent treatise on the subject and is intended as a modern and concise text book for both the beginner and expert pattern-maker.

The book is written in a very pleasing manner and is so clear that the beginner need have no hesitation in proceeding with work. The chapters on molding and core making are particularly valuable as the average pattern-maker does not possess sufficient knowledge on these subjects and they are very essential. The absence of such information frequently results in disputes between the molder and pattern-maker.

The book contains 214 pages and 312 illustrations showing the various steps in making patterns. It treats on wood pattern-making only. The publishers are The Popular Mechanics Co., Chicago, Ill. The price of the book is $1.00.

In casting brass in iron molds for rolling into sheet or drawing into wire, lard-oil as pure as possible is now used for coating the surface of the molds. Fish-oil answers equally as well but has an objectionable odor.

Tempered Gold.

One of the materials which has recently made its appearance on the market is called "tempered gold" and with the usual hue and cry made in the daily newspapers, it was looked upon as another of the frequent "tempered copper" discoveries. Good reports having come in, however, of the excellent qualities of the material, it was deemed worthy of investigation and it may be frankly said that it holds out considerable promise.

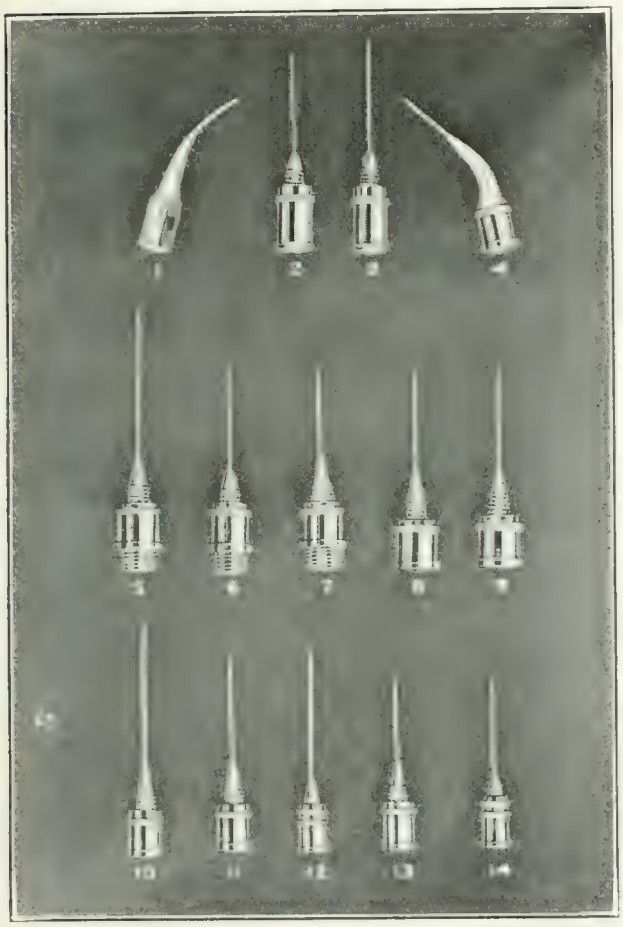


Fig. 1. Hardened or Tempered Gold Hypodermic Needles.

In the first place, the gold is not tempered in the sense that steel is treated, but the usual trade corruption has resulted in applying the term "tempered" and the public assuming that it is actually made in this manner. As a matter of fact the gold is *hardened* and *not tempered* and if the term hardened were applied to it, it would be scientifically correct. The fact that surgical instruments are being made of it which will take a razor edge is a sufficient indication that the process is worthy of notice.

This process has been worked out by A. L. Thurston the laboratory superintendent of the Automatic Fire Protection Company of Whitestone Landing, N. Y., who has spent many years in perfecting it. He is frank to state that the gold is hardened by another metal and that pure gold cannot be made hard. From 18 karat gold down is made and the lower the karat, the harder the gold on account of the larger quantity of the alloy that can be employed. After alloying and casting, the gold is hammered in order to shape the instruments and then ground. As far as can be ascertained, one of the rare elements is used for hardening the gold. Inasmuch as Mr. Thurston has conducted experiments along these lines it would seem the natural and logical method of making it.

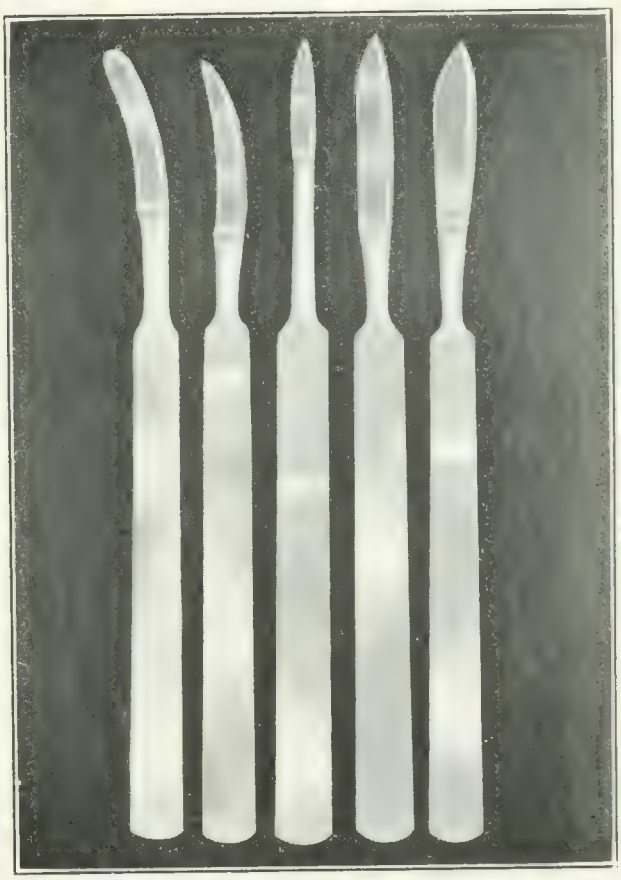


Fig. 2. Tempered Gold Surgical Instruments. The Handles are of Silver Welded On.

The fact that not only is gold being hardened to such an extent that it will take a cutting edge and in addition is being sold on the market indicates that the process is real. It is actually a fact that with the instruments made, a hair can be cut as clean as with a steel knife.

Silver can also be hardened by the same process, but it does not seem to be quite as

susceptible and cannot be made as hard. It is possible, however, to produce an alloy of silver that will take a cutting edge.

One of the uses of the tempered gold is in hypodermic needles and they are now being manufactured at the works in Whitestone Landing. Many thousands are already in use. They are made of the gold and then drawn down to the required size. A special alloy, somewhat softer than the cutting instruments, is necessary for this purpose, and yet the needles are as stiff as one of steel. The fact that the gold is not attacked by liquids used in the needles really demands that they shall be employed in a hypodermic syringe.

Although the instruments and needles are being made at Whitestone Landing, N. Y., they are marketed by the Tempered Gold and Silver Corporation, 159 La Salle St., Chicago, Ill., and are carried in stock.

The advent of this process for hardening gold and silver is of much importance as it indicates a field yet untouched in the metallurgy of the noble metals, and it is probable that many other new uses can be found for them in the alloyed and hardened state.

Fire-Cracking of Gold During Annealing.

Manufacturing jewelers frequently have trouble with their gold during annealing on account of fire cracks. It is more apt to happen in tubing and rods than in sheet and was far more prevalent in the past than at the present time. Many manufacturers have found that the use of a small quantity of zinc in the gold alloy is beneficial in preventing fire-cracks.

Gold tubing is usually made by drawing a round blank of sheet into a cup then swaging down to a tube-shell, and finally drawing down over a mandrel on draw-benches. The fire-cracking generally occurs after the tube has been partially made.

The cause of fire-cracking is the brittleness of the gold at the annealing temperature, and this brittleness is usually caused by the presence of oxide of copper in it. The customary alloy for gold to reduce it to the karat condition is copper and silver. The silver does not cause any trouble, but as the copper oxidizes while melting and as there is nothing to remove it, it remains in the gold and causes the brittleness. By the use of a small quantity of zinc in the alloy, the oxide of copper is reduced and a tougher metal produced. It is advisable, however, on account of the small quantity used, to add it in the form of an alloy of copper and zinc. This copper and zinc alloy is made up as follows:

Lake Copper	8½ oz.
Bertha Zinc	1½ oz.

It is customary to pour the mixture, when melted, into water to shot it as it then forms small pieces suitable for use. It is sold on the market in this condition.

The mixture of copper and zinc thus made is used instead of copper in making up the karat gold. To use in making up the gold melt the following formulas may be taken:

For 18k Gold.

Gold	18 parts
Silver	3 parts
Alloy	3 parts

For 14k Gold.

Gold	14 parts
Silver	4 parts
Alloy	6 parts

The quantities of silver and alloy given, however, may be varied to suit instances where the color is desired red or yellow. The more silver used, the yellower the alloy. The increase in the quantity of the alloy results in a redder shade. The alloy, however, is always used in place of the copper and it is easy to make any particular gold mixture by thus employing it.

Current Efficiency in Silver Plating.

According to a German investigator who made a series of investigations upon the current efficiency in the ordinary cyanide silver solution, the loss is very small. He found that in a cyanide silver solution containing 1% of silver (about ¾ oz. per gallon) the current efficiency is from 99.2% to 99.4%. With 2½% of silver in the solution (about 2 oz. per gallon) the current efficiency is from 99.3% to 99.6%.

An old solution has less current efficiency on account of the foreign matter it contains. It was also found that the current efficiency was lowered by agitation on account of the oxygen absorbed. The reduction was found in this case to be from 0.50% to 1%.

A New Method and Apparatus for Treating Brass Skimmings.

The treatment of brass skimmings has always been one of the difficult problems in the brass foundry. In the old days it was the custom, in many foundries, to pick out of them what metal could be seen that appeared to be of value, and throw the rest on the dump. Later, when washing machines began to be installed for washing the furnace ashes, the skimmings were put with them and also washed, a very wasteful practice. Then further economies were evolved and the skimmings were kept separate and sold. This, too, is the riddling of the skimmings. The fine material is sold and the coarse used over again. This method is also quite wasteful of metal.

A process for treating brass skimmings has recently been brought out by The Metal Dross Economy Company of Bristol, Conn., which results in the production of, undoubtedly, the greatest economy of any of the processes yet known for the purpose. It was devised as an accessory to their well known skimming tank, by means of which practically all of the metal in brass skimmings is saved. When a crucible of brass is skimmed into the tank, the charcoal, dross and metal all go in and are then removed and treated by the apparatus to

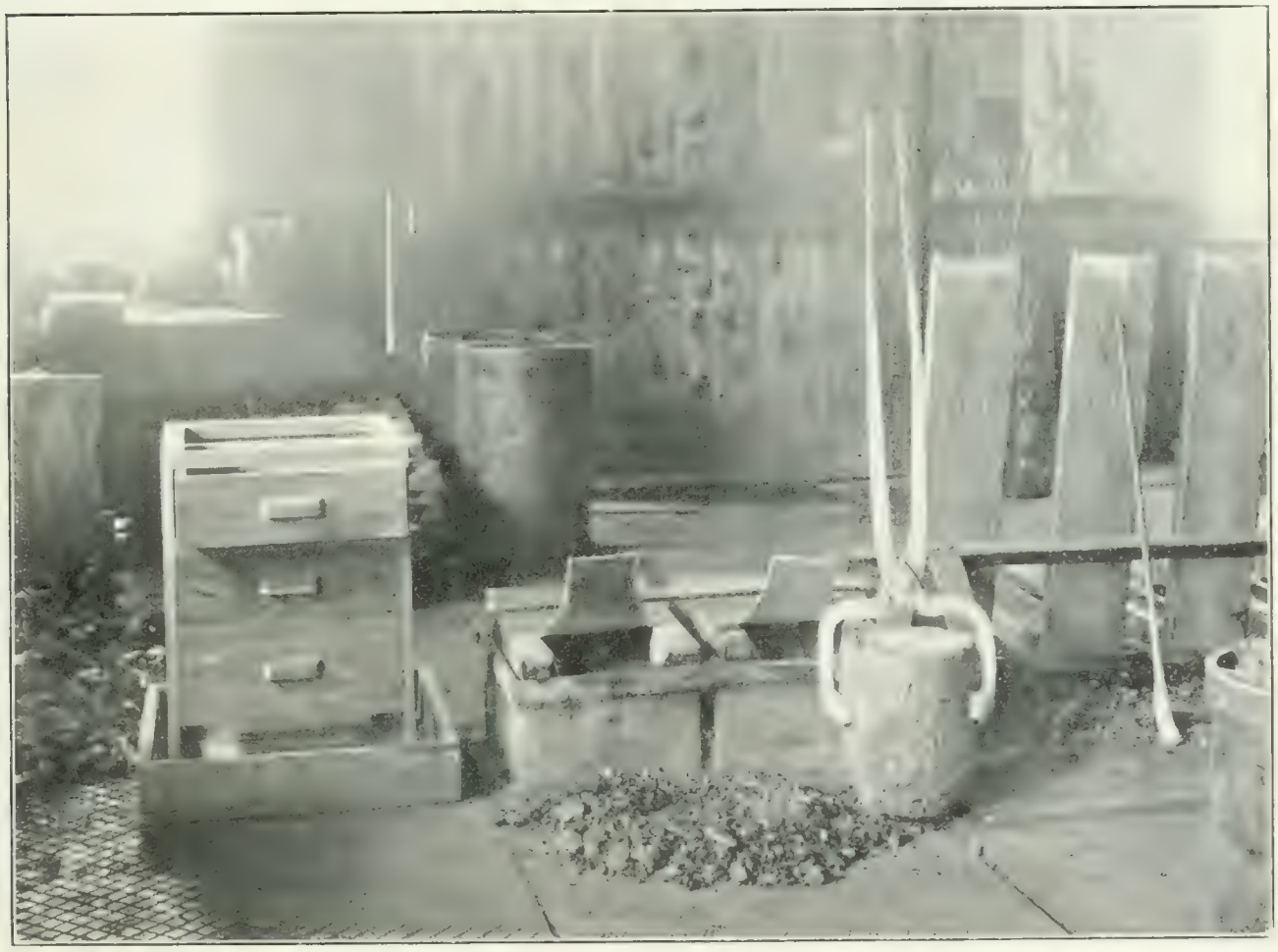


Fig. 1. Recovering Cabinet Used for Treating Brass Skimmings. A Pair of Skimming Tanks is Also Shown.

resulted in loss as nothing was received for the zinc in the brass and the skimmings were usually sold at a low price. Even when modern practice is followed and the skimmings sold on assay, nothing is obtained for the zinc and they are of value only for the copper in them. The final economy that has followed be described, and known as The Metal Dross Economy Company's "Recovering Cabinet".

This recovering cabinet is shown in Figs. 1 and 2. In Fig. 2 a detailed view is given, while in Fig. 1 the skimming tanks and cabinet are shown together. The cabinet itself is made of wood and is fitted with a number

of drawers in the bottom of which is fastened screen cloth of varying mesh. In the top, as shown in Fig. 2, a coarse mesh screen is used and the mesh in the next is finer and so on. The top screen is quite coarse and usually consists of 10 mesh. The finest screen is in the bottom and a 60 mesh cloth is fitted to the drawer. At the extreme bottom is a shallow tank for saving the finest material that passes through the fine screen. The method of using the cabinet is as follows:

Fig. 2. The Recovering Cabinet for Treating Brass Skimmings.

The skimmings from the skimming tank or those from the floor are placed in the top drawer and a stream of water turned on them for a minute or two. This washes out all of the fine material and leaves the charcoal, coal or coke and large pieces of metal. The coal or coke can be picked out, the drawer removed and the contents dumped out. This material may be used over again without further treatment as the charcoal and metal in it are excellent for putting on top of the crucible. It is even unnecessary to dry it as it has been demonstrated that it gives equally as good results if used damp; in fact, it is constantly being done in a number of establishments.

After the first drawer has been removed in the cabinet, the water is turned on the second for a short time and the contents washed. A mass of charcoal and metal are obtained suitable for use. In the other drawer, the process is repeated and fine material is obtained which is free from oxide of zinc and foreign matter and consists of quite clean metal. The material in the last drawer is quite fine and may be used or sold if desired. The majority of concerns using the process prefer to melt it.

The material which goes through the last screen into the tank below it consists principally of oxide of zinc, and it has been shown by chemical analysis that it contains such a small amount of metal as to be practically of no value.

The theory of the process lies in the fact that by the use of the screens of varying fineness, and washing the skimmings with water, the oxide of zinc is washed away and clean metal and charcoal left. The fact that the residues obtained melt without difficulty indicates that the refractory nature of yellow brass skimmings is caused by the presence of oxide of zinc. By this process it is removed. An application has been made for a patent upon the process as it is considered of sufficient novelty to warrant it.

Artificial Rubber for Knife Handles.

A method of making a rubber substitute has been patented by Hubert C. Hart of Unionville, Conn., who has been identified with the cutlery and flat ware industry for many years. He has patented the use of the material for knife handles, (U. S. Patent 948,727, Feb. 8, 1910).

The method used for making the rubber substitute is to take a mixture of ground rags and paper and impregnate it with chloride of zinc. The following proportions are used:

Paper and Rags	75 %
Zinc chloride	25 %

The proportions of paper and rags are not given, but a certain percentage of rags is required in order to prevent the mass from becoming too brittle. The mass, after ground and treated with the chloride of zinc, is heated and pressure applied while in the mold. The pressure and heat remove the moisture and a mass resembling rubber remains. Coloring matter may be added to the mass if desired.

The presence of carbonates in a silver plating solution, as it becomes old and has decomposed, produces a rough deposit.

Mildew on Nickel Plated Stove Castings.

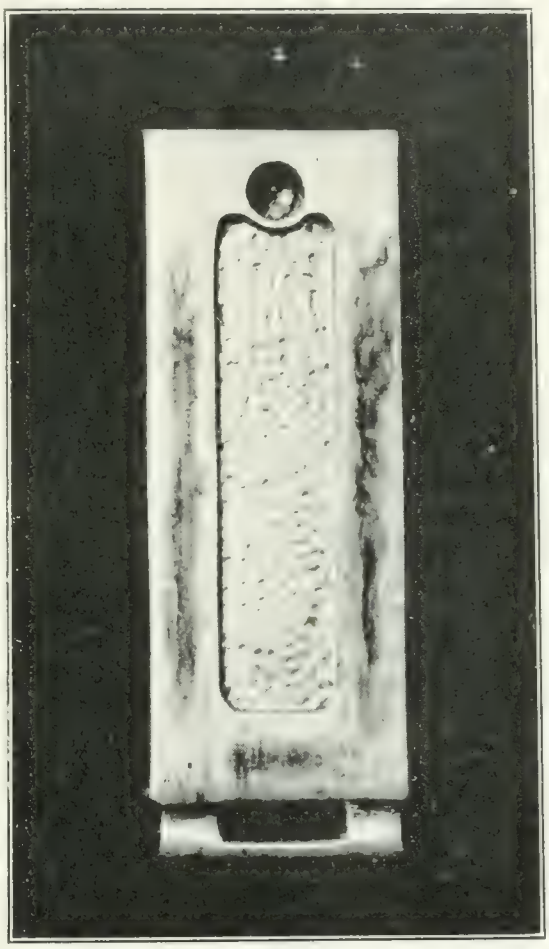
It often happens that a sort of mildew or frost appears on nickel plated stove castings after they have stood for some time. A casting showing this difficulty is herewith reproduced. The mildew does not appear all over the surface, but in particular portions. The illustration shown hardly does justice to the article as the color is exaggerated, but it will serve to indicate the manner in which it occurs.

It usually appears after the polished surface has stood for a little time. If wiped off at once, it seems to do no harm; but if allowed to remain upon the surface for some time, it corrodes the nickel and it must be buffed again. If allowed to remain for a longer time, the corrosion is so great that simple buffing will not remove it and the nickel must be polished off and re-nickeling done.

One concern which has been troubled considerably with mildew has been accustomed to treat their iron castings as follows: The castings are pickled in the iron foundry before taking to the plating room. They are, of course, allowed to remain for some time before the plating is begun and rusting sets in to a certain extent. The foundry pickling is done to clean the sand and scale from them. When the plating is commenced, the castings are first pickled for from 3 to 5 minutes in a sulphuric and muriatic acid solution containing wood alcohol, spirits of nitre and common salt. They are then rinsed in cold water, then immersed in a lye solution and finally in hot water and dried. The castings are then polished. They are cleaned in an electrical cleaner, and run through the sulphuric and muriatic acid dip again, next scrubbed and rinsed, afterwards immersed in a weak muriatic acid pickle and finally returned to cold water before entering the nickel plating solution.

The mildew frequently made its appearance after the work had been polished and before nickel plating. This would indicate that the difficulty is in the pickling in the foundry The mildew is really a variety of spotting-out. Cast-iron is quite porous and in pickling, the acid enters the pores. During the length of time that the pickling consumes, it has ample time to do this. In the foundry, the castings usually receive very little rinsing; in fact, it is generally confined to playing a hose on them. It will readily be appreciated that such a rinsing will not remove the acid from the pores.

The best method of eliminating the acid is to soak the castings for a considerable length of time in lime water. This will not rust the castings at all, is cheap and the lime neutralizes the acid forming inert and solid sulphate of lime. The lime water and not slaked lime should be used as the latter is too thick. Very little lime is required. A number of days of this soaking is none too much as it has now been well established that alkalies do not rust iron.



Nickel-Plated Stove Casting Showing Mildew on Surface.

Then remove the castings and soak them in clean water for some time, after which they are ready for removing. It is good practice to allow the castings to dry out for some time so as to give the liquid that is left in the pores an opportunity to dry out. Drying out at ordinary temperatures is better than heating them although the use of an oven is more rapid. The longer the castings are allowed to remain in the air to dry out, the better they

will be and the less will be the liability for them to spot-out in the form of mildew.

If a sand-blast can be used instead of pickling, and there is much work upon which it can be employed, it will be found that the mildew will not be apt to make its appearance unless it comes from the plating operation.

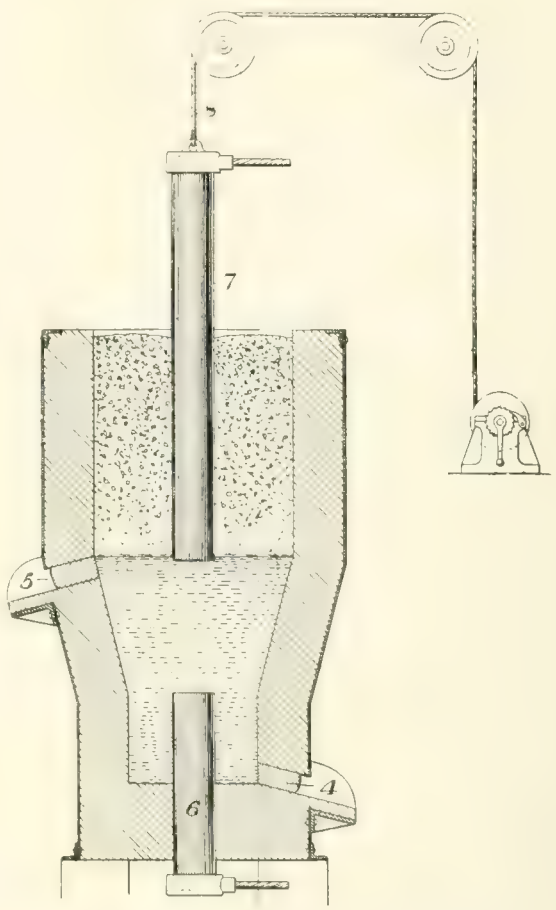
It is possible in the case of porous castings, to produce the mildew even though the casting may have been sand-blasted and not pickled in the foundry. The nickel solution may penetrate the pores and then gradually ooze out after the work has been finished. It is not as apt to happen, however, as it is when the pickle is not removed. After nickel plating the castings, they should be well rinsed in water and allowed to soak for some time, preferably in hot water and then in clean cold water. By the alternate use of hot and cold water, a sort of pumping operation is formed, so to speak, by the expansion and contraction of the iron, and the plating solution in the pores is replaced by pure water which soon dries out. Ample time should be given the castings to dry after rinsing.

It is certain that by following these instructions, the appearance of mildew on nickel plated stove castings will not be found to any extent, but the surface will remain bright without further treatment.

Electric Furnace for Reducing Tin Dross.

When tinning is done, or tin or its tin alloys melted, tin-dross is formed. This is usually sold to smelters who reduce it to metal, first by the process known as "sweating" by which the particles of metal are united so that they can be freed from the oxide; and second, by actually reducing the oxide left to metal. This reduction process is carried out in a reverberatory furnace and the oxide is reduced to metallic tin by carbon in the form of coal and by the use of a reducing flame. Such a process is in almost universal use.

An application of the electric furnace for smelting tin dross has recently been patented by Raymond S. Wile of the American Sheet and Tin Plate Co., of Pittsburgh, Pa. (U. S. Patent 947,723, Jan. 25, 1910). The furnace is herewith shown in cross section. To commence the smelting operation, broken glass is fed into it when the electrodes are in contact. They are shown by 6 and 7 and are of carbon or graphite. The upper electrode is slightly raised so that an arc is formed. The glass now melts and the upper electrode is then raised until it just dips into the bath of molten material. The tin dross is mixed with coke or coal dust and fed into the top of the furnace. The heat causes the reduction of the oxide of tin constituting the dross, to metal and it then sinks to the glass which causes the particles to



Electric Furnace for Smelting Tin-Dross.

unite and settle to the bottom. The molten tin is then tapped off through the tap-hole 4. In case the slag becomes too refractory after a time, it may be tapped off through the tap-hole 5 and fresh glass added. The process is thus practically continuous, and with a cheap electric current should prove an excellent method of reducing the dross.

The fire-cracking of karat gold is usually caused by the presence of oxide of copper in it. It is formed during the melting of the copper used for alloying with the gold.

The Oldest Aluminum Smelting Plant in the United States.

The Electric Smelting & Aluminum Company of Lockport, N. Y., enjoy the distinction of being the first in the United States to smelt aluminum from its ore. In 1885, Messrs. E. H. and A. H. Cowles of Cleveland, Ohio, discovered by heating a mixture of oxide of aluminum (corundum) and coke or charcoal with metallic copper in an electric furnace, that the aluminum was reduced by the carbon at the high temperature thus produced and alloyed with the copper forming aluminum bronze. Soon after works were started in Lockport, N. Y.

Plant of the Electric Smelting & Aluminum Company at Lockport, N. Y. The First in the United States in Which Aluminum Alloys Were Commercially Made.

The works herewith illustrated were erected in Lockport for the reason that water was available which supplied the cheap power necessary. When started, and for a number of years, the company was known as the Cowles Electric Smelting & Aluminum Company; but the name has since been changed and the business remains the same.

When the works were erected, the largest electric generator in existence was installed and the first electric furnace to be used commercially was built.

Soon after it was found that many other interesting and valuable alloys could be produced. Among them was silicon-copper an alloy of silicon and copper and now extensively used for making sound copper castings. This valuable alloy is made by heating a mixture of sand, coke and shot copper in the electric furnace. The high temperature produced reduces the silicon which combines with the copper forming the alloy of copper and silicon. By using manganese oxide an alloy of copper and manganese is produced.

The first products of the company were the

aluminum-bronzes, silicon-copper and similar alloys. The pure aluminum was made and finally a list of many special alloys was added. They are now producing pure aluminum, aluminum-bronze, silicon-copper, manganese-copper and a large variety of alloys for special purposes.

The Wet and the Dry Process of Using the "Hill" Cinder Crusher.

In installing a cinder crusher such as the "Hill" barrel (so-called) for washing brass foundry ashes to reclaim the metal that is in them, it is often a question, whether to use the wet or the dry process. As some concerns use one and some the other, it is difficult for one who has had no experience to determine the better method.

An investigation of quite a number of plants in which both the wet and the dry process is used has failed to reveal that any more metal is obtained in one than the other. The tailings in each run from 3 to 6-per-cent in copper. It is believed, therefore, that as far as *production* is concerned, there is no choice in the methods. The only reason, however, for using the dry method is the absence of water in sufficient quantity or its high cost.

In the wet process the brass foundry ashes are placed in the barrel and a small stream of water is allowed to flow through it while turning. In this manner the fine material that is ground up is washed away. By the fine material is meant the slag, coal and ashes that are present. In the wet process a stream of water that is too strong will wash away metal as well as the foreign matter. When the wet process is completed, the washings of metal left are clean and bright, and while no better than those produced by the dry process have a much better appearance. Some concerns use salt water and unless this is washed off with pure water at the last, the washings will corrode and have a bad appearance. For melting, however, it does not injure them.

The method followed in the dry process is to place the ashes in the barrel and blow or suck a current of air through it while revolving. In this way the ground foreign matter is blown away. Like the wet process, the use of too strong a blast will blow particles of metal out. An installation of the dry process requires a special equipment in the form of a blower and is quite dirty on account of the formation of a large quantity of fine dust. The metal obtained from the barrel in the dry method is not as clean in appearance as that produced by the wet process. The dry process is somewhat slower than the wet method, as in order to remove the foreign matter it must be ground to fine dust, even much finer than is necessary when water is used.

If a barrel is to be installed and plenty of water is at hand, then by all means use the wet method of treating the ashes as it will be found more satisfactory than the dry one.

Lead Pickle Tanks.

For containing a sulphuric or hydrofluoric acid pickle, either hot or cold, there is no material from which tanks can be made that will equal lead. It is cheap and resists the action of the pickle so that it gives long service. It is a very common error, however, to make the tanks of too thin lead; in fact, it is a mistake so frequently made that particular attention should be called to it.

The pickle itself rarely corrodes a lead tank to such an extent that it will leak as its action is even and very slow. The main source of leakage is from the puncture of the lead sheets by objects dropping into it, or careless workmen allowing the material to be pickled to strike the sides or bottom with too much force. There is really only one method of coping with the problem and that is to make the tank "fool-proof".

Make the tank of as heavy sheet lead as possible and, of course, burn the joints together. Solder will not do. This fact, however, is too well known to require comment. Protect the sides of the tank by strips of wood. A double bottom or one of sheet lead much heavier than the sides is preferable as the principal location punctured is at the bottom on account of objects falling down upon it. In pickling, articles with sharp edges and quite heavy are frequently treated and these are the ones that cause trouble.

It is false economy to try to save in making a pickle tank by using sheet lead that is not heavy. Leakage is a matter of much annoyance and expense and the remedy is so apparent that it naturally seems unnecessary to comment upon the question; but, nevertheless, it is often disregarded.

A Small Centrifugal Drying-Out Machine.

The need for a small, centrifugal drying-out machine for use in the manufacturing jewelry trade, or in other lines of work in which small quantities of metal goods are to be dried, has been of long standing; and while the excellent large machines now on the market take care of the industries in which large quantities are dried, they are too expensive and too large for small concerns.

Hough's Centrifugal Dryer for Small Work.

The machine herewith illustrated is made for the small manufacturer. The articles to be dried are placed in a basket which is then revolved at a rapid speed. Hot air is also drawn in so that no matter whether the pieces are cup shaped or not, they are rapidly and completely dried.

The machine is adapted for drying goods that have been plated, dipped, colored or washed. The advantage of a centrifugal dryer is that no sawdust is required and that the work is *thoroughly* and *rapidly* dried. The disadvantages of sawdust are well known, and for many classes of goods are such as almost to prohibit its use. The centrifugal dryer leaves nothing upon the work and there is no danger of abrasion from careless handling, or from stains being left from incomplete drying. The machine is now manufactured for the trade by the Estate of A. O. Kellogg, 250 Eddy St., Providence, R. I., and is known as "Hough's Centrifugal Dryer."

Dip Silvering.

Much dip silvering is done upon small brass and copper goods and is a cheap and easy method of silver plating without any electric current. The success of the operation is in the use of the right dip. It is easily made, but many persons do not use the right proportions of materials in making it. The secret of success lies in the use of no free cyanide in the solution. The cyanide used should take up all of the silver nitrate that it will dissolve. An excellent formula and one extensively used is as follows:

Solution A

Water	1	gallon
Silver nitrate, crystals ..	¼	oz.

Solution B

Water	1	gallon
Potassium cyanide	1	lb.

Add Solution B to A (pour the potassium cyanide solution into that of the silver nitrate) little by little with stirring. A precipitate is at first formed which then is dissolved. When no more of the precipitate will dissolve, add no more. If any precipitate remains undissolved after vigorous stirring, then add a little more of the cyanide until it just barely dissolves. The object is to use just enough of the cyanide solution to dissolve the silver nitrate and no more. In this manner no free cyanide is present. Use the solution hot at a temperature of about 150 degrees F.

If the dip contains much free cyanide, the silver will come dull and yellow. By using no free cyanide, it will deposit on the work in a perfectly white and bright condition. The secret of bright dip silvering is to have no free cyanide.

Investigations carried on by E. Schutz in regard to the affinity of metals for sulphur, showed that manganese has the most affinity of any of the common metals. The following series show the relative affinity from manganese, which has the most, to lead which has least: Manganese, copper, nickel, iron, tin, zinc and lead.

A New Apparatus for Agitating Plating Solutions.

A new method of agitating electroplating solutions has recently been devised and patented by Willis R. King of the Hanson & Van Winkle Co., of Newark, N. J. (U. S. Patent 948,056, Feb. 1, 1910). The method followed may be understood by referring to the accompanying sketches. In Fig. 1 a plan view is shown, while Fig. 2 gives the vertical cross-section.

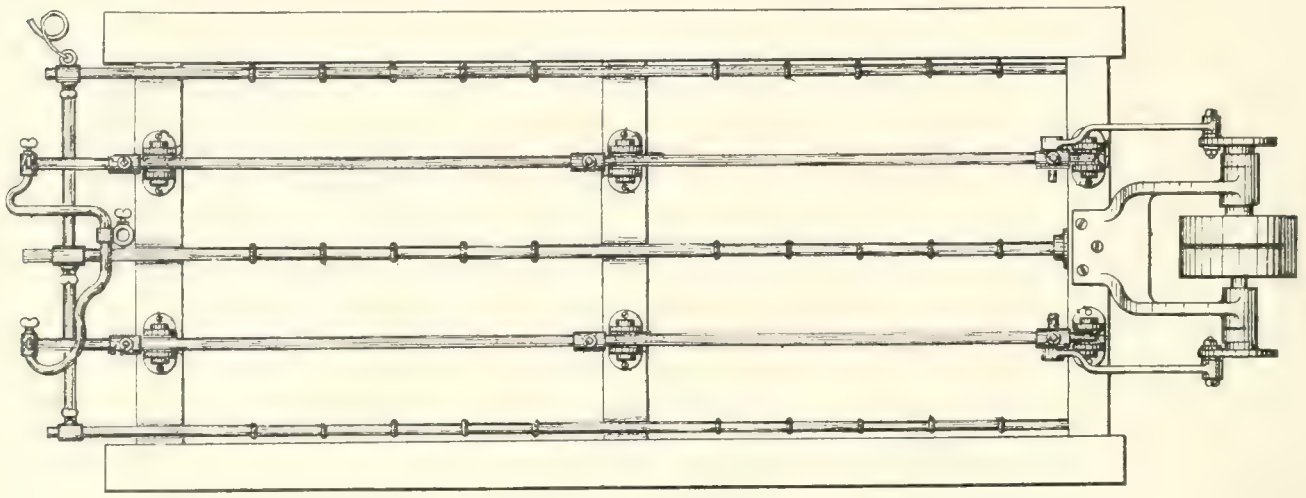


Fig. 1. Plan View of King's Apparatus for Agitating Nickel Solutions.

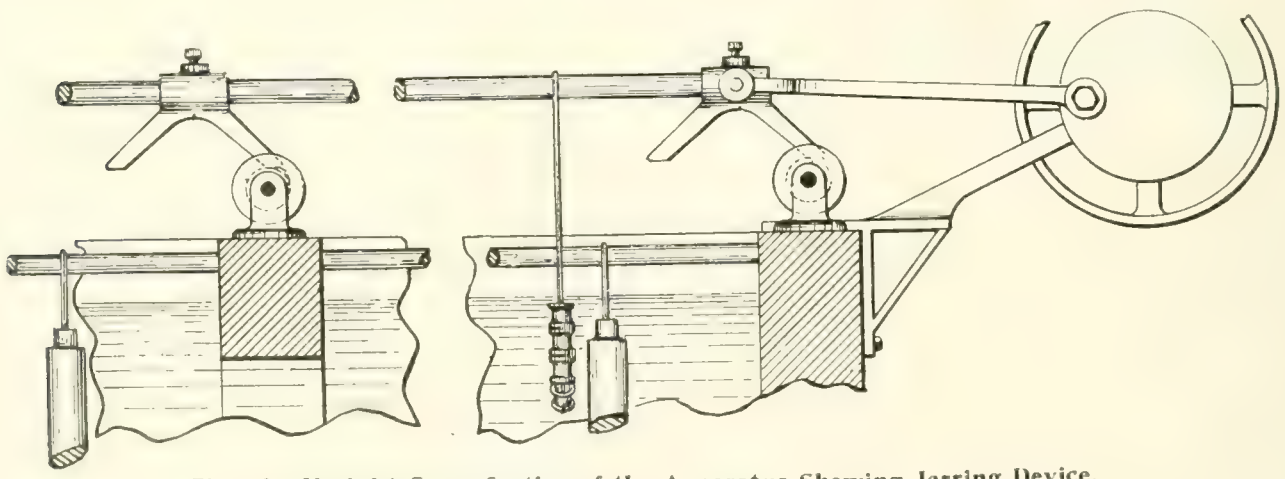


Fig. 2. Upright Cross-Section of the Apparatus Showing Jarring Device.

The articles to be plated are attached to the cathode rod in the usual manner. The rod is connected to an arm attached to a pulley to impart a reciprocating motion to it. This serves to move the work to and fro in the solution. The real novelty of the invention however, lies in the use of tripping devices in the form of wheels situated on the top of the tank. Attached to the rod carrying the work are forked trips which engage the pulleys as they pass over. The cathode rods, therefore, are given a jar or vibration as they pass.

The advantage of the vibration of the cathode rods is that bubbles of hydrogen gas which attach themselves to the surface of the work being plated, are removed and pitting is less apt to occur. At the same time, the movement of the work while plating allows a higher current density to be used and with the resulting increased rapidity of deposition.

For the parting of gold and silver, the sulphuric acid process has become almost obsolete and electrolytic processes have supplanted it. At one time all the gold and silver were parted by the sulphuric acid process at the U. S. Government Assay Office in New York City, but at the present time it is carried on at the Mint in Philadelphia by the electrolytic method.

A New Plaster Molding Composition for Use in Casting Metals.

A new plaster of Paris molding composition for making molds to be used in casting metals has been patented by J. J. C. Smith of Passaic, N. J. (U. S. Patent 950,355, Feb. 22, 1910) and which is of much interest for the reason that the inventor was one of the original patentees of the process for using plaster molds and casting in a vacuum, both of which patents are now owned by the Gorham Mfg. Co., of Providence, R. I. The present invention has been devised more particularly for casting stereotypes to be used in printing, although any kind of metal, art or commercial, may be readily cast in the mold. The advantage in casting stereotypes is that a much harder metal may be used than can be cast in the ordinary manner. The patent is of sufficient importance to describe in detail. The inventor states his process as follows:

"My invention relates to compositions for making molds for use in casting metals, and more particularly for use in making stereotypes or for reproduction in metal of designs possessing fine details, and it has for its object to produce a mold which will faithfully reproduce and retain the finest details of the patterns; withstand the heat of the molten metal, be free from tendency to crack or check; have superior tenacity to enable it to be withdrawn cleanly from the patterns, and have when set and hardened, a degree of porosity sufficient to permit the escape of air and gases therethrough in the casting operation, and also possesses other superior characteristics and advantages which will more fully hereinafter appear.

For producing a molding material having the above characteristics, I take an argillaceous material of fine texture and good tenacity and plasticity. I have found potter's clay of fine texture to be well suited to the purpose of the invention and therefore preferably use this material. I take said potters' clay and form thereof, with the addition of water, a thick cream-like slush. I then take a suitable quantity of fine short asbestos fiber and mix the same with water, to bring it to a consistency similar to that of the clay slush. I next thoroughly mix the clay and asbestos slushes together in equal proportions by volume. This mixture may be kept in this condition, and is always ready to be mixed with plaster of Paris as hereinafted described. Instead of the fine asbestos fiber above mentioned, I may use finely ground silicate or silicious material or pumice stone and obtain satisfactory results, but I prefer to use asbestos as stated. After the materials are in the condition above described, the pattern which it is desired to reproduce is suitably prepared and arranged for taking the mold. When this is done, I mix sufficient plaster of Paris with water to bring the same into a thick cream-like consistency. To the plaster so prepared I add about one-third of its volume of the clay and asbestos mixture above described, and mix the same thoroughly by well stirring, when the molding composition is ready to be poured upon the pattern or design. The composition will settle and flow into the finest detail of the design and when set or hardened will give an exact reproduction thereof to the finest and most delicate details. After allowing the composition to remain on the pattern for about twenty or thirty minutes, the mold will have hardened sufficiently to be removed from the patterns. After removal the molds are placed in a drying oven and heated to a temperature of about 600° F. for a period of from two to three hours, to eliminate all moisture.

It will be found that the molds so produced will not only take and reproduce faithfully the most intricate designs, but will not suffer any deterioration or damage, such as shrinking or cracking, either from the heat to which they are subjected in drying or from the heat of the molten metal cast therein. It will also be found that the molding material is of such tenacity that it will withdraw clean and perfectly from the pattern. It will also be found that the mold will possess a superior degree of strength and tenacity to enable it to resist the pressure employed when metal is cast therein under pressure.

By the use of molds, made in accordance with my invention and their superior resistance to heat, I am enabled to use them especially for casting stereotype plates of metals of greater hardness and consequently having a higher melting temperature than metals now employed for this punrpose, and am also able to produce stereotypes of such metal possessing the finest of detail, which is now obtained only by the use of electrotypes.

Sang's Method of Copper Plating by Cementation.

A method of copper plating iron or steel by the process known as "cementation" has recently been discovered by Alfred Sang. The method of carrying out the process is similar to that of the now well-known process of Sherardizing. In the latter operation the iron or steel is heated in a mass of zinc dust to a temperature slightly below the melting point of zinc. The iron or steel then becomes coated with zinc, and the depth of the coating depends upon the length of time consumed in the operation. A thick or a thin coating may be obtained as desired.

In the method of copper plating, copper dust is employed and the process is similar. If a mixture of copper and zinc is employed, a brass coating, more or less perfect, may be obtained. Sand describes his process as follows:

"In carrying out the invention, the articles to be coated are first thoroughly cleaned by any well-known method, such as pickling or sand-blasting, or by the combined steps of pickling and sand-blasting. They are then placed in a closed vessel and are packed or covered with metallic copper in the form of a very fine dust or powder, or with a mixture of copper dust and another metal, such as zinc dust, depending upon the character of the coating which is to be formed. The receptacle is then subjected to heat substantially as in the sherardizing process, except that a somewhat higher temperature (preferably about 1000 degrees F.), should be employed when copper alone is used, or when a considerable percentage of copper is employed.

When the articles are removed from the receptacle, after it has been allowed to cool, if copper alone has been used as the covering or packing material, they are found to have on their surfaces a smooth, uniform, and closely adherent coating of copper, of a thickness depending upon the length of time occupied in the treatment. When a mixture of copper and zinc dust is employed, the articles will be found to have a double-layer coating, the inner layer being copper and the outer layer of zinc, with the two layers more or less alloyed where they join each other. The surface layer of the coating may be thick enough so that the articles will present substantially the same appearance as sherardized articles, but if this coating be cut or scratched through, there will appear an underlying layer of copper, with an intermediate brassy portion where the two layers are alloyed. By properly regulating the proportions of zinc and copper dust, the coating may be made to consist substantially wholly of an alloy of the two metals. I have found that five per cent. (by weight) of copper dust, or even less, mixed with zinc dust, will give a plainly perceptible coppery appearance to the coating.

Carbon may or may not be used in the receptacle during the operation. When used it need not be in powdered form but may be either powdered or in lumps, the latter being preferred.

The copper used should be in the form of a very fine powder or dust. I preferably obtain this dust by precipitating the copper from a solution of its sulphate by means of zinc dust. I use a cold copper sulphate solution, adding the zinc dust slowly, and with agitation, which gives a precipitate in a very fine form.

I preferably subject the receptacle containing the articles to be coated and the material in which they are packed to agitation during the time the receptacle is being heated. Instead of mixing zinc dust with the copper, I may use some other metal instead of zinc dust. I have also found that by using a graphite or clay, or clay-lined receptacle, much better and quicker results are obtained, with less loss of coating metals.

The coating produced by the invention is superior to that produced by any other method with which I am familiar; since copper is harder and more resistant than zinc, and affords a better protection against oxidation, especially when exposed to sea-water. When the coating consists of a compound layer of copper and zinc, it has peculiarly resistant properties, due in part to the double coating as such, and in part to the interposition of the copper between the iron and steel and the zinc, whereby there is a less abrupt difference in the electro-chemical properties of the iron and steel and of the outer zinc coating."

The process as above described has been the subject of a recent patent granted to Mr. Sang (U. S. Patent 948,662, Feb. 8, 1910).

In nickel plating zinc, the best results are obtained by first brass plating it before nickeling. A better color is then obtained on the nickel. When first copper plated, the nickel is not as white as upon brass.

An Economical Two-Part Anode.

The anode which has been recently constructed by C. H. Buchanan, the well known nickel plating expert who is associated with

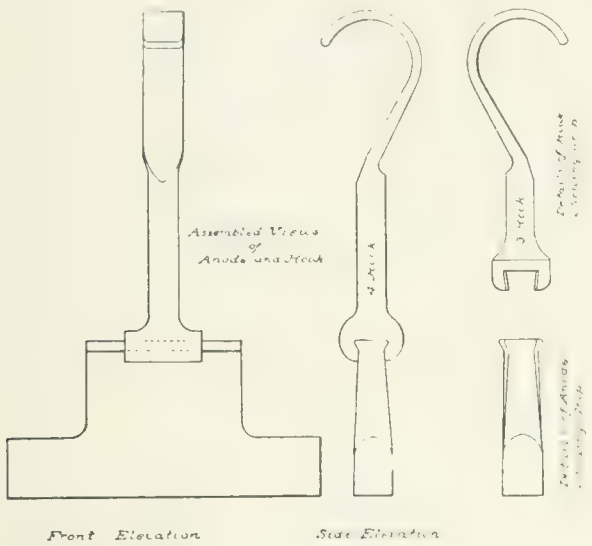


Fig. 1. Detail of the Method of Making the Hooks.

C. Upham Ely, 60 Vesey St., New York City, has proved to be an economical one. It is herewith illustrated. In Fig. 1, is shown the details of the hook and in Fig. 2 the type of anode used with it is illustrated.

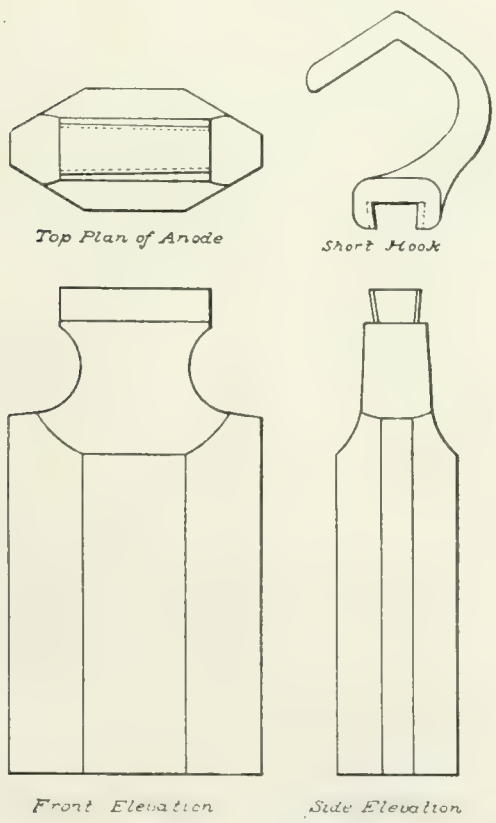


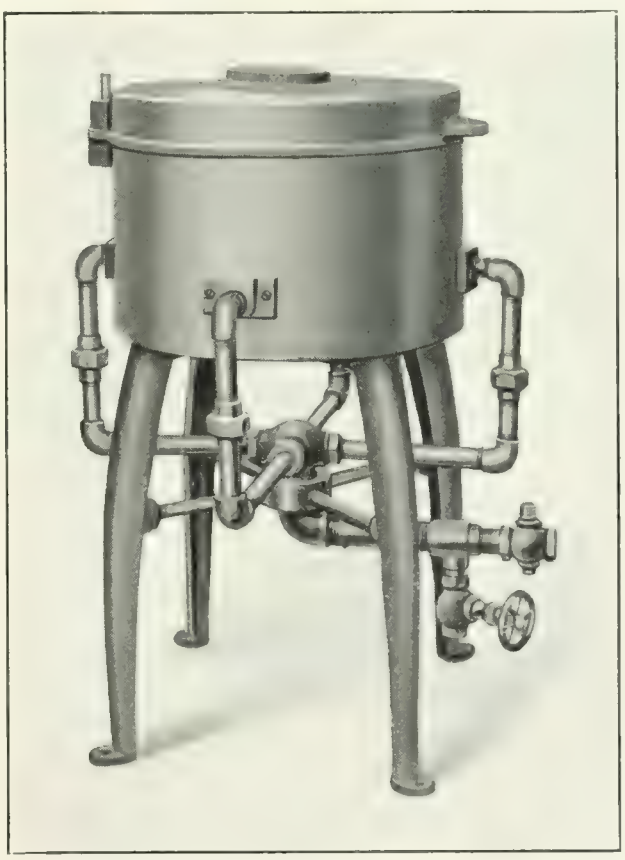
Fig. 2. Manner of Making the Anode.

The hook is cast separately and is attached to the anode by means of a tapering dovetail. When used, the hook is driven on tightly and the whole used until the anode has become useless when the butt-end is driven off and a new anode inserted. In this manner the same hook may be used continuously.

Although patented some time ago, this hook and anode have only recently been placed on the market and the use of the same hook continuously results in an economy that is at once apparent.

The "Westmacott" Gas Melting Furnaces.

The melting furnaces made by the Westmacott Gas Furnace Co., 68 Clifford St., Providence, R. I., are the result of many years of study to evolve a furnace that will answer the



The "Westmacott" Gas Melting Furnace.

requirements of manufacturers who desire to melt metals in crucibles. Gas is the most convenient form of fuel for melting, and for melting gold, silver and other metals in a small way, it cannot be equalled. It gives a high heat and is clean and uniform. The

melting is under complete control and may be made as rapid or slow as desired.

The Westmacott furnaces are different from others on the market, and as will be noticed from the accompanying illustration, are supplied with a number of burners. This feature is valuable as it allows a uniform heat to be obtained without the danger of cracking the crucible. The air is supplied by a blower and enters at a central opening so that uniform distribution is obtained. The furnaces are made for hard usage and are very handy. They require no special equipment as no smoke or fumes is given off and they may be placed in an ordinary room.

The Westmacott Gas Furnace Co., make these furnaces in a large number of sizes, supplied with a blower and ready for use. They likewise manufacture gas muffles, annealing furnaces, heating furnaces and a large variety of similar products. Their furnaces are supplied with a novel feature in the shape of a movable bottom which is easily replaced when necessary, at a small cost.

A New Method of Preparing Iron or Steel for Tinning or Galvanizing.

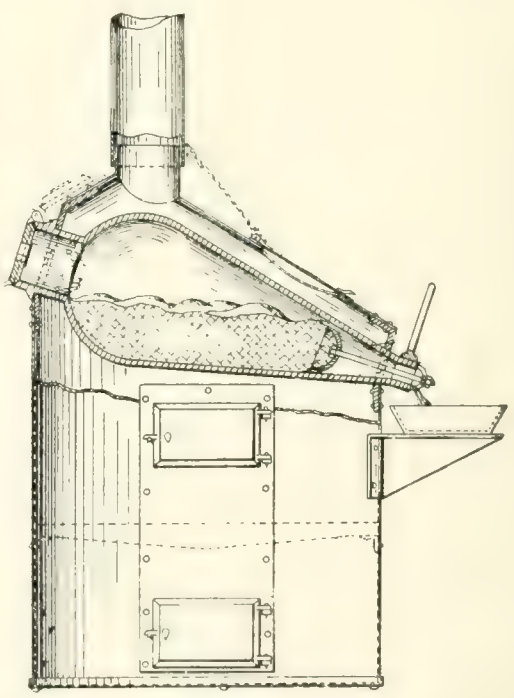
In tinning or galvanizing, it is frequently found that the surface of the iron or steel that has been coated, contains small imperfections in the shape of pin-holes which are nothing but portions of the metal that have not been covered. Pin-holes are particularly apt to occur in tin plate (tin coated sheet steel) and are often a detriment.

A method of treating the surface of iron or steel for tinning or galvanizing has been patented by Henry Howard of Boston, Mass. (U. S. Patent 949,575, Feb. 15, 1910). The process is more particularly applicable to tinning as the requirements of galvanized surfaces are not so severe, but at the same time, it is equally as efficacious.

The process consists in first pickling the iron or steel in the usual manner in acid, then washing and finally immersing in an electric cleaner consisting of a strong solution of sodium carbonate or sodium hydroxide in water (or both). The article to be cleaned, such as, for example, a steel sheet, is connected with an electric current as the cathode. The anode may be an iron or steel sheet. During the passage of the current, sodium deposits upon the metal to be cleaned, but it is immediately acted upon by the water and hydrogen gas is liberated. Now herein lies the principle of the process. In the ordinary electric cleaning operation, in which grease or oil is to be removed from an article, the hydrogen gas mechanically pushes it off; but in the present method, it is claimed that the action is performed by the metallic sodium. The acid in the pores of the iron or steel is neutralized, the remaining oxide film is reduced, and the surface is left in a condition that prevents its oxidation so readily, as follows when removed from the acid pickle. In other words, the electric cleaner seems to leave the metal in a less oxidizable condition and in a better condition for the tinning than can be obtained by tinning direct from the pickling bath.

A Novel Dross Sweating Furnace.

Tin-dross, babbitt-dross, lead-dross and other soft metal drosses in which tin or lead is the principal constituent are first put through the so-called "sweating" operation to reclaim the metal in them before the oxide, which they



Furnace for "Sweating" White-Metal Drosses.

contain, is reduced in a reverberatory furnace. This "sweating" operation, as usually practiced, consists in heating the dross on an iron pan and stirring it frequently. The small particles of metal in it are thus united, and as the pan is

inclined, the molten metal runs out. The oxide only is left.

An improved method of "sweating" the dross from soft metals has been patented by Geo. L. Walker of Pueblo, Colorado (U. S. Patent 949,311, Feb. 15, 1910). While the process was devised for "sweating" type-metal dross, it is applicable to all soft metal drosses in which tin or lead is the chief constituent.

An ordinary furnace heated by coal or other desired fuel is employed. A cast-iron retort is inserted in the top so that the heat passes around it. It is inclined so that the metal will run out. One end is provided with a cover that the retort may be closed from the air when in use. At the lower end, out of which the metal runs after it has been united, a stopper is inserted to keep the dross from falling out. This stopper may be seen in the illustration. It is perforated so that the liquid metal may flow through it.

The mass is stirred from time to time by inserting an iron rod through the top opening. The cap is then replaced and the whole mass is heated out of contact with the air. In this manner a larger yield is produced and less oxide formed. The residue, of course, is smelted in a reverberatory furnace in the usual manner.

Use of Transparent Carborundum as Gems.

A method of making transparent carborundum of a character that, when cut in the regular manner like a diamond, possesses a value as a gem, has recently been discovered by Frank J. Tone of the Carborundum Company of Niagara Falls, N. Y. He has found it possible to produce colorless, transparent crystals which have a high index of refraction. The inventor states that the index of refraction exceeds even that of the diamond.

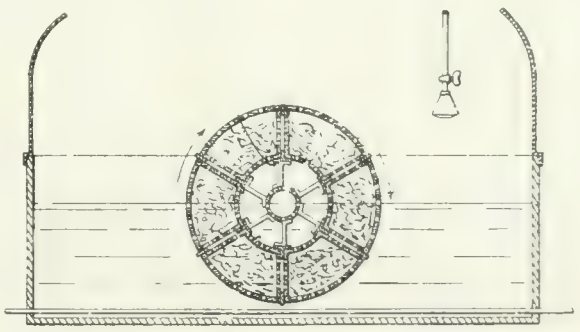
Carborundum, as well known, is silicon carbide and is made in the electric furnace from sand, sawdust, coke and a small quantity of common salt. At the present time it is used as an abrasive and is supposed to have a hardness exceeded only by the diamond, (and possibly boron carbide).

By using pure materials and keeping the carbon in the mixture as low as possible, Mr. Tone has found that it is possible to produce transparent crystals of carborundum of great beauty. The mixture employed for the purpose consists of the following: Pure carbon 30%; silica, 57%; sawdust, 9%; and common-salt, 4%. A special manipulation is carried on in the electric furnace to produce the desired results in the way of preventing the formation of an impure product. By mixing a small quantity of a metallic oxide, such as chromium oxide, in the mass used for the charge, a colorless crystal may be produced.

This discovery seems to be of more than passing importance as it would appear to be but a step to the production of the synthetical diamond.

Extracting Tin from Old Tin Cans and other Tin Plate Waste.

According to a method recently patented by Heinrich Brandenburg of Kempen-on-the-Rhine, Germany, the tin may be readily removed from old tin cans and other tin plate waste by placing it in a tumbling barrel made of wire cloth and immersing in a solution of caustic soda. The barrel is herewith shown in cross-section and is made in compartments, so that one may be removed if desired while the others are in use.



The feature of the process lies in the fact that the barrel is not wholly immersed in the solution, but is partly exposed to the air. In this manner there is a constant aerating process going on which is beneficial in removing the tin. The caustic soda is used hot and the tin goes into solution as sodium stannate. It can be recovered from this solution by electrodeposition in the ordinary manner of plating.

As grease and other foreign matter are always present in tin cans, a "head" forms on the surface of the solution. A rose water tap, as shown in the illustration, is used to spray water on to keep it down. The sides of the tank are also built up so that this foam will not flow over them.

Questions and Answers.

Question No. 758. In casting brass for rolling, is it customary or advisable to coat the iron molds over with graphite and oil before pouring the metal, or only oil alone? Does the graphite have any value for this purpose?

Answer. While some brass casters use graphite on the molds, it is doubtful whether it has any value. Some brass casters do not use it all, and we have not found that it has any value. It is much less used than formerly, and it may be said that the majority of brass manufacturers do not use it on their molds. Oil is used alone.

Question No. 762. What is the advantage of the wet over the dry process in using the Hill barrel for grinding and washing brass foundry cinlers, ashes, etc., in order to reclaim the metal in them?

Answer. The wet process is cleaner and gives a cleaner and better looking metal. It wastes a little more metal than the dry process. The wet process is generally used when water is not too expensive, and requires less installation.

Question No. 764. Which aluminum alloy is preferable for automobile work? The aluminum and zinc mixtures or those of aluminum and copper?

Answer. Use the aluminum and copper mixtures. They cast so much better than those of aluminum and zinc that they are far more satisfactory. The aluminum and zinc alloys are quite apt to crack in the mold.

Question No. 765. A steel door hinge which we are plating with copper shows a large number of spots standing for some time after lacquering. What is the cause?

Answer. The cause of the spots is undoubtedly blisters formed in copper deposit during plating. These hold solution which gradually works out and stains the surface. You are using too strong a current in copper plating the steel.

Question No. 767. We recentlv have had considerable trouble, on account of the cracking of our aluminum castings, and we believe the cause is the amount of zinc in the mixture. We have been using the metal for crank cases and similar work and find on removing the castings from the mold, that either they have cracked or are warped to such an extent that it is impossible to use them. We have attempted to straighten them, but they are so brittle that they break. We wish to use what metal we have, if possible, and ask if you can suggest any method for it?

Answer. Your difficulty is undoubtedly caused by the zinc. Make up the following mixture: Aluminum, 93 lbs. and copper, 7 lbs. To it you can add from 5 to 10 lbs. of the aluminum and zinc mixture without encountering much trouble, but if you do, reduce it. The aluminum and copper mixtures always give the best results.

Question No. 768. What is the dark, blue-black finish that is used on some of the automobile lamps now found on the market?

Answer. While we have not seen the particular lamp you mention, we presume it is an oxidized silver finish as this has a blue-black color. Give the lamp a fairly heavy silver deposit and then oxidize in a hot liver of sulphur solution made by dissolving 3 oz. of liver of sulphur in 1 gallon of water. When an even coat has been obtained, rinse and dry. You can then bring out the lustre with a dry scratch brush or by buffing with a soft buff without rouge. Then lacquer with a suitable lacquer. The so-called gun-metal lacquers are excellent for the purpose.

Question No. 769. Is there any method by which the size of a round blank for spinning can be cut to make a certain shell, such as those used on the base of a chandelier? Or is it a matter of guesswork?

Answer. The matter is one of guessing or judging until the first shell has been spun and then the exact size of the blank can be determined. An experienced spinner usually knows about how large in diameter to cut the blank on the first trial and after one has been spun, and then the exact size of the blank can be determined.

Question No. 770. We are making some curtain-rod balls of sheet steel and are brass plating and then tinning them, but wish to know if there is any cheaper method of doing it?

Answear. As you are undoubtedly tinning them by the cream of tartar method, we doubt whether you can improve on the process. You might tin the steel direct, but you will not obtain the white color that is required for such work.

Question No. 771. What sort of a bearing for a cold rolling mill will the following mixture make:

Copper	90%
Tin	5%
5% Phosphor-tin	5%

Answer. You will find it to be a good bearing, but the addition of 10% of lead will greatly improve it and give it greater wearing qualities with less heating. The use of lead in bearing bronzes for cold mills has now been thoroughly established as essential. Use no zinc in the mixture.

Question No. 772. We have some poor malleable-iron automobile lever handles to brass plate and the holes and other imperfections in them have been soldered up. In brass plating them, the solder does not take the deposit well, and when buffed it shows through. The handles also blister. How can the difficulty be overcome?

Answer. You are probably corroding the

solder while cleaning and the surface is then oxidized so that it will not take the brass deposit. When the levers come from the cleaning kettle, scour the solder with a brush and fine pumice and it will clean it so that it will take the deposit. Brass, however, does not deposit as well as copper and the best method, and one followed in many establishments, is to "strike" the handles in a *hot* cyanide copper solution before brass plating. In this manner a better and more adherent deposit is produced and you will have no trouble with the solder. Your blisters are probably caused by the use of too strong a current in endeavoring to cover up the solder. By the use of the hot, copper "strike" it will be avoided.

Question No. 773. In what sort of molds are sticks of cadmium cast? They are sold in sticks about the size of a lead pencil and six or eight inches long.

Answer. They are cast in an iron mold. The mold is made in halves so that the sticks can be easily removed. The mold sets upon a bottom of cast-iron so that the metal will not run out. A number of sticks are cast in one mold which contains an equivalent number of holes for the purpose. Cadmium melts at such a low temperature that it will run in the mold if slightly warm.

Question No. 774. In plating with black nickel, I find that the deposit comes black and streaked after running the work from 1 to 1½ hours. Sometimes it comes gray all over. The dip of perchloride of iron does not seem to take off this gray color.

Answer. You are using too strong a current. Cut it down so that the deposit comes black. When streaked or gray it always indicates that the current is too strong and the dip, in such a case, will not aid you.

Question No. 775. What is the best mixture for casting bronze letters to be used for signs?

Answear. The following mixture will cast well and give you a fine color:

Copper	88 lbs.
Tin	8 lbs.
Lead	2 lbs.
Zinc	2 lbs.

Question No. 776. I am having trouble with my brass solution which has been running about 3 years. The deposit is very slow in forming and the color a sort of gray-green, and really does not look like brass. Before, a little copper, the sodas and a small quantity of ammonia have always restored it, but it now refuses to work upon such an addition. It stands about 16 degrees Beaumé. What do you think is the cause?

Answear. We should judge that your solution is old and needs invigorating. We suggest throwing away a portion of it and adding new solution to it. Upon exposure to the air, a solution containing cyanide changes to carbonate and thus becomes overloaded with foreign matter. It may be possible that your anodes are not clean and suggest cleaning them thoroughly and see if any change takes place. If not, then we feel that your solution is too old. In many establishments it is customary to throw away a portion of a brass solution from time to time and add new material to it so as to keep it in good working condition. In one establishment, which we have in mind and where the solution is worked "hard", a portion of it is thrown away each week. A hot solution, too, deteriorates much more rapidly than a cold one.

Question No. 777. We are sending you a sample of very thin, seamless copper tubing that we are making and which you will notice has been tinned and has cracked. The tubes are used in radiators and our customer claims that they are defective and break under a pressure of 5 lbs. We have tested the tubes before tinning and find that they show no leakage even at 40 lbs. What is the cause of the leakage after they have been tinned?

Answer. The tinned tube shows a very poor job of tinning. The tin was too hot and the copper and tin alloyed rendering it brittle. You are, no doubt, aware that copper and tin produce a brittle alloy and it may be seen on the tip of a soldering copper which has been heated too hot. The tubes are so thin that they are easily ruined by the overheated tin. Keep the tin at as low a temperature as possible and you will have no trouble. Use chloride of zinc as a flux into which the tubes are dipped before tinning. It seems to us that whoever tinned them believed that a very hot tin was necessary and, possibly, used little or no flux as the tinned tubes are very rough and unsightly.

Question No. 778. How can the numbers sunk in an aluminum dial be blackened? These numbers are stamped with a die so that they are below the surface. In order to be seen, they must be blackened while the raised surface is left in the natural aluminum. We are now blackening them with a black enamel paint and then wiping off the exposed portions, but find it costly. Is there any better method?

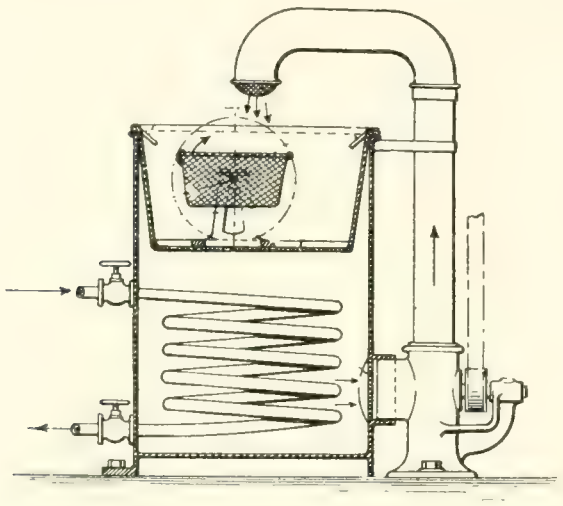
Answer. We can suggest no better method. There are many such operations that are more costly than they should be, but no one has apparently been able to overcome the difficulty. If the dials were etched they could be blackened easily, but you would probably find the cost of the etching greater than that of your own process. In the etching process the background is plated with copper before removing the resist and then oxidized in liver of sulphur, after which the resist is taken off.

Question No. 779. Is there any harm in using tin in brazing solder composed of half copper and half spelter? We believe that it would be of value in making it flow better.

Answer. You had better keep the tin out of the solder as a small quantity will do no good and yet will cause it to become brittle. In order to reduce the melting point of the solder to any extent, it would be necessary to add so much tin that the resulting mixture would be too brittle to be of any value.

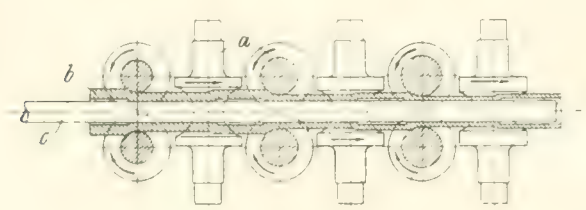
Patent Abstracts.

948,763, Feb. 8, 1910. MEANS FOR DRYING ARTICLES OF JEWELRY, ETC. Arthur W. Hutchins, of Cranston, R. I. A machine similar to the well-known centrifugal one for drying-out work after plating, or other operations in which the articles are wet, and to dispense with the use of sawdust. The



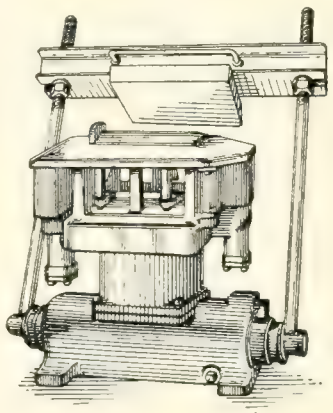
articles are placed in the perforated basket and rapidly revolved over and over by a shaft driven by a belt or motor. The basket is *not* given a centrifugal motion. While turning over and over, a blast of hot air is driven upon the basket. The air is taken from under the apparatus and is previously heated by a steam coil shown. A fan driven by a belt is used for forcing the air upon the basket.

948,961, Feb. 8, 1910. MANUFACTURE OF TUBES. Mathias Peters of Benrath, near Dusseldorf, Germany. A method of rolling seamless tubing so that a mandrel somewhat shorter than the finished tube itself may be used. The power required to strip the tube from the mandrel is also lessened. The pro-



cess is performed by passing the tube through rolls in which the eccentricity or ratio of the distance of one focus from the center to one-half of the major axis of the oval shaped groove is the same throughout all the rolls. In other words, the process is accomplished by the use of roll-grooves of oval character and special cross-section.

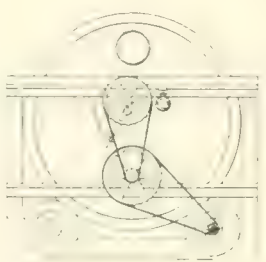
948,975, Feb. 8, 1910. MOLDING-MACHINE COUNTERBALANCE. Edward M. Huggins of Philadelphia, Pa. The counterbalance is in the form of a coiled spring in the



bottom of the machine out of the way of the molder and sand, and so adjusted in tension that the yoke is at all times easily moved back and forth.

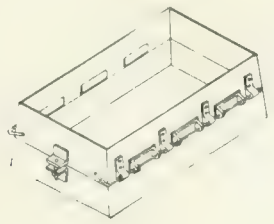
949,500, Feb. 15, 1910. PROCESS OF BLUING IRON OR STEEL ARTICLES. Morgan Rees of Follansbee, W. Va. A method of bluing iron or steel sheets for producing the so-called Russia sheet-iron. The sheets are heated in a closed muffle and steam admitted when the temperature has reached about 700 degrees F. With the steam, powdered charcoal and sulphur are blown in by an atomizing device. The sheets are pickled previous to bluing.

948,270, Feb. 1, 1910. SAND BLAST MACHINE. Charles A. Dreisbach of New Haven, Conn. Assignor of one-half to Wm. J. Smith of the same place. This invention is upon a sand blast tumbling barrel for sand



blasting small castings in bulk. The castings are placed in a separate screen receptacle and inserted in the barrel itself. The sand blast is then applied in the usual manner. The sand is used over again and the dust is removed during the operation.

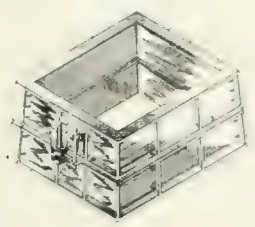
947,261, Jan. 25, 1910. SAND RETAINING DEVICE FOR FOUNDRY FLASKS. Arthur Scrivenor of Richmond, Va. A device for use on molding flasks so that a snap flask need not be used for making molds. At the side cam shaped pieces are provided which are



worked in and out by a lever. When pressed in, as shown, they hold the sand in place like a lip on the flask, and when it is desired to release the sand, they are pulled out and the sand is easily slipped down. The flask is made with tapering sides so that when the cams are released, the sand will drop out. The flask is intended to be used in place of a snap-flask.

948,764, Feb. 8, 1910. ELECTRIC WELDING, BRAZING OR SOLDERING. Oscar Kjellberg of Gottenborg, Sweden. A stick of the brazing material, such as steel or brass, is made one pole of the electric current and the work to be brazed the other. By means of a non-conducting covering, the arc that is formed in brazing does not spread, and allows the fused metal to run where it is required.

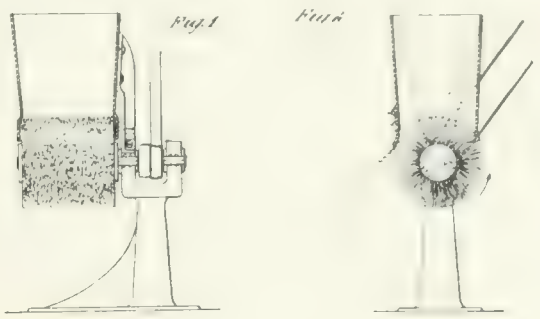
948,528, Feb. 8, 1910. MOLDING FLASK. Charles D. Smith of Dayton, Ohio. The object of this invention is to provide a convenient means for removing the sand from the



flask so that it may be slid outwardly in removing the flash from the mold, and by the same grip which seizes the flask in the movement of same.

949,464, Feb. 15, 1910. ADJUSTING DEVICE FOR ROLLING MILLS. Simon Dean of Steubenville, Ohio. A wedge-shaped adjusting device for equallizing the pressure exerted on rolls when sheet metal is rolled.

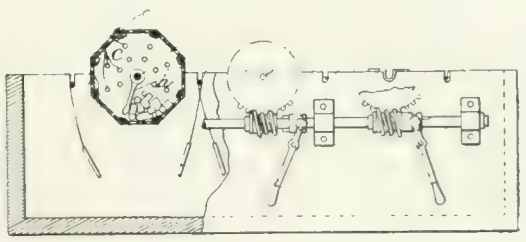
948,129, Feb. 1, 1910. SAND-GRINDER. Gustav R. Bilz of New York City. Assignor to Rudolf Miller of Maspeth, N. Y. The object of this device is to pulverize or grind



molding sand. The sand is fed into a hopper and comes in contact with a rapidly revolving brush when it is forced against a place and then driven out in a pulverized condition.

948,926, Feb. 8, 1910. ARC LIGHT ELECTRODE. Isador Ladoff of Cleveland, Ohio. An arc light electrode composed of an alloy of nickel and chromium in the proportion of from 50 to 90 per-cent of nickel and the remainder chromium. A more luminous and steadier light is said to be obtained by its use.

950,068, Feb. 22, 1910. ELECTROPLATING APPARATUS. Nathan S. Emery and Benjamin W. Gilchrist of Woodhaven, N. Y. A plating barrel designed to plate small articles in bulk. The barrel is rotated by a worm gear and inside a series of "danglers"



are placed to form the contact with the work and to stir them up while the plating is going on. The staves of the barrel are connected in a new manner and the apparatus is so designed that it may be easily filled and emptied. It is also stated that the barrel may be used for polishing work by tumbling.

948,814, Feb. 8, 1910. PAINT AND VARNISH REMOVER. Mayer Daxe. A liquid for removing paint or varnish. It consists of Benzol, 2 gallons; Alcohol, 2 gallons; Acetone, 1½ gallons; Wax ¼ lb.; Kerosene, ½ pint; Petrolatum or Petroleum-Jelly, ½ to 1½ lbs.

Trade Items.

Oliver Bros. of Lockport, N. Y., manufacturers of brass bedsteads, have commenced the manufacture of automobile radiators.

The National Novelty & Mfg. Co., has been incorporated at Terre Haute, Ind., to manufacture brass novelties and other metal goods. Among other things, an alcohol sadiron is to be made.

The Coe-Stapley Mfg. Co., recently incorporated to manufacture sheet brass and similar metal goods, are now located in their factory at 1565 Railroad Ave., Bridgeport, Conn. A plating plant has been installed and is in charge of Louis Martel.

A four-story, brick and steel plant is being erected by the Victor Lamp Company on Spring Grove Ave., Cincinnati, Ohio, and which is to be used in the manufacture of automobile lamps. It will be equipped with the latest machinery and manufacturing is to be commenced within a few months.

The Stark Rolling Mill Company of Canton, Ohio are manufacturing a new variety of coated sheet steel called "Alumaloyd Metal" which is steel coated with a special alloy containing aluminum. It is particularly recommended for automobile bodies and similar work on account of its smooth surface. In this respect it is superior to galvanized sheet and the coating offers a protection similar to that of zinc.

An order for 1,500,000 lbs. of aluminum wire was recently placed with the Aluminum Co., of America of Pittsbuhgh, Pa., by the Hydro-Electric Commission of Ontario, Canada. The wire is to be used for the transmission of electric current from Niagara Falls and to supply the cities of Toronto, Windsor, St. Catherine and Welland as well as some smaller towns in that vicinity. The wire will be drawn at the works of the Aluminum Co., in Niagara Falls and Massena, Quebec.

C. G. Hussey & Co., of Pittsburgh, Pa., proprietors of the Pittsburgh Copper & Brass Rolling Mills, have purchased the sheet copper business conducted by the Crucible Steel Company of America at Pittsburgh, Pa. This business was established in 1859 by Park, McCurdy & Co., and afterwards by the Park Steel Co. When the Crucible Steel Co., was organized it took over the business. The business was an extensive one and all sizes of copper sheets were made as well as sheet brass. The sale includes the stock on hand in ten cities in the United States and Canada. The business of C. G. Hussey & Co., was established in 1847 and is now one of the largest in the United States. They carry a very extensive stock of sheet copper, brass and yellow metal and manufacture rivets, nails, gaskets, hammers, washers and soldering-coppers.

J. W. Conway, formerly of the Standard Foundry of Hartford, Conn., has started a brass foundry at 424-432 Broad St., in that city.

At the annual meeting of the Williams Bros. Mfg. Co., of Naubuc, Cann., manufacturers of silver plated ware, a ten per-cent dividend was declared and in addition a 100 per-cent stock dividend was paid out of the earnings.

The annual report of the American Brass Company of Waterbury, Conn., recently issued to the stockholders, showed the amount of dividends paid as $900,000 against $787,000 in 1908. The gross earnings for 1909 were $1,089,583. The capital stock of the company is $15,000,000.

The plant formerly occupied by the Superior Chain Company at Marysville, Pa., has been leased by the Central Zinc Co., of New York City and the manufacture of spelter will be commenced. It is stated that about 60 hands will be employed. A new process is to be employed.

George J. MacLoughlin, formerly one of the proprietors of the Century Camera Company of Rochester, N. Y., has become actively interested in the Pullman Mfg. Co., of that city, manufacturers of hardware specialties. The facilities of the company will now be enlarged to take care of their rapidly increasing business. The "Pullman Sash Balance" is one of the specialties manufactured by the company. Electroplating is also carried on.

The Mond Nickel Company has issued emphatic denials through the press that the International Nickel Company control the nickel deposits of Canada. This statement recently appeared and they have taken occasion to contradict it. The Mond Nickel Company is an English concern and obtain their product from Canada. The completion of the refining is carried on in England, although about 90 per-cent of the refining is carried on in Canada. The refining is done by the Mond process by which a volatile nickel carbonyl is obtained and which is then decomposed with the formation of metallic nickel.

The W. S. Rockwell Company, 50 Church St., New York City, manufacturers of oil and gas burning furnaces of large variety, have issued their catalogue Number 3 describing the burners, pumps, blowers, tanks and accessories which they manufacture. The catalogue is compiled in an excellent manner and contains much useful information Among other information is given the relative capacity of oil tanks of varying dimensions so that prospective users of oil may easily ascertain the size of a tank that must be used to hold a certain number of gallons. The catalogue is for gratuitous distribution and should be in the hands of all concerns or individual melting metals.

The Acme Plating Company of Columbus, Ohio, are now in the hands of a receiver.

Several acres of land have been purchased by the Aluminum Castings Co. of Buffalo, N. Y., (formerly the Allyne Brass Foundry Co.) and a new foundry to cost $30,000 is to be erected.

The name of the Evansville Brass & Iron Bed Mfg. Co., of Evansville, Ind., manufacturers of brass and iron bedsteads, has been changed to the Evansville Metal Bed Company. The capital stock has also been increased from $60,000 to $100,000.

The Royal Button & Novelty Works has been started in Berlin, Canada for the manufacture of metal buttons. The factory is at 18 Queen St., South and is the first to make fancy metal buttons in Canada. The industry has been started by Witte Bros., formerly of Newark, N. J.

The Ornamental Iron & Bronze Company recently incorporated in Cleveland, Ohio, with a capital stock of $15,000 has started to manufacture at 10,611 Quincy Ave. Ornamental iron and bronze work is to be made. A. J. Hollingshead is the president and general-manager.

The brass foundry of the New Departure Mfg. Co., of Bristol, Conn., under the management of Christopher O'Connell, is to be moved back to the main shop on North Main St., where it was formerly located. Some time ago, it was transferred to the plant formerly occupied by the Liberty Bell Co. Owing to the rapid increase in the business, it has been found imperative to have a large brass foundry. It is expected that the change will be made by July 1st.

The Castle Lamp Company, recently organized in Toledo, Ohio, with a capital stock of $300,000 to manufacture automobile lamps, are to erect a large plant in that city. This company is practically a reorganization of the Atwood-Castle Company of Amesbury, Mass., and it is said that the Amesbury plant will be moved to Toledo. A site has been obtained near the factory of the Overland Automibile Company and officers of this company are interested in the Castle Lamp Company. F. E. Castle, general sales manager of the Atwood-Castle Co., is at the head of the new company.

A committee on non-ferrous metals and alloys has been appointed by American Society for Testing Materials for the purpose of compiling standard specifications for such materials. A preliminary meeting was held on February 21st, in Earle Hall, Columbia University, New York City and at which time Dr. William Campbell of the University was appointed Chairman. Nothing definite was decided and as the committee is not yet complete, and a number of the original members are unable to serve on account of lack of time, another meeting is to be held later at which time the full compliment of members will be announced and sub-committees appointed.

The Fowler Lamp & Mfg. Co., of Chicago, Ill., now located at 2335 Wabash Ave., have purchased a factory site on 24th St., and will erect a three story factory on it. The manufacture of automobile lamps and accessories is carried on.

The Metal Dross Economy Co., of Bristol, Conn., manufacturers of skimming tanks for saving the metal in brass skimmings, have sold the foreign patents and rights for the process to Ernest Rosenberg, 48 Retterstrasse, Berlin, Germany. The Canadian rights have been sold to the Skinner Company of Gananoque, Canada.

The firm consisting of Lewis Beitzel and George Thornburg and doing business under the name of the Crescent Park Brass Foundry at Waltham, Mass., has been dissolved. George Thornburg has purchased the interest of Mr. Beitzel and will conduct the business as before. Brass, bronze and aluminum castings are made. The foundry is at Crescent Park.

The John R. Keim Mills, of Buffalo, N. Y., have been purchased by the Ford Motor Company of Detroit, Mich., manufacturers of automobiles and will be devoted exclusively to the manufacture of the parts for their cars. The Keim plant is situated on Kensington Ave. and Erie R. R. Belt Line and has been engaged in the manufacture of stamped and pressed steel goods. At present some 600 hands are employed, but it is expected that the number will be doubled in the near future.

The Sanitary Company of America has been organized with a capital stock of $1,000,000 to take over the business of the Mitchell & Van Meter Company of Philadelphia, Pa., and with plants at Linfield, Pa., and Pottstown, Pa. A new plant for making brass goods will be established at 13th and Cumberland Sts., Philadelphia, Pa. The Linfield plant will be used for iron work while the Pottstown plant will be used for brass goods of a special variety. The new plant in Philadelphia is to be used for ground key work.

The Risdon Tool & Machine Company, Inc., has been incorporated in Waterbury, Conn., to take over the plant and business of the Risdon Tool Works of that city and which recently went into the hands of a receiver. The capital stock is $25,000. The facilities for manufacturing are to be enlarged. Dies, tools and small metal goods are manufactured and a specialty made of sub-press work. It is expected that a new factory will be erected later, possibly at Naugatuck, Conn. Some of the men interested in the company are W. L. Shepard, superintendent of the American Mills Co. of Waterbury, A. H. Dayton, vice-president and G. T. Wigmore, assistant-cashier of the Naugatuck National Bank, C. E. Beardsley, auditor of the American Brass Company, Matthew Adgate, superintendent of the Naugatuck Chemical Co., C. T. McCarthy and G. W. Andrews of Naugatuck.

The capital stock of the National Brass & Copper Co., at Lisbon, Ohio, has been increased from $225,000 to $375,000.

The Rubien-Manning Company has been organized in Providence, R. I., to manufacture jewelry. They are located at 151 Pine St.

The Mattatuck Mfg. Co., of Waterbury, Conn., manufacturers of upholstery hardware and small brass goods, have increased their capital stock from $75,000 to $225,000. The increase was in the form of a stock dividend of 200 per-cent.

The Albert Lea Gas Light Company has been incorporated in Albet Lea, Minn., to manufacture gasoline lights and lighting systems. The capital stock is $200,000. A factory will shortly be built and manufacturing commenced. S. K. Swenson is the general manager.

The National Lead Company of New York City has acquired an interest in the United States Cartridge Co., of Lowell, Mass., one of the largest manufacturers of ammunition in the United States. This company is a large consumer of lead in the form of shot and bullets. Large additions to the plant are contemplated.

The American Metal Market Company, 81 Fulton St., New York City, publishers of the *Daily Metal Market Report,* have inssued a neat and valuable little book called "Metal Statistics for 1910". It gives metal statistics in an extensive manner and contains much other valuable data. As a book of reference it will prove of great service to metal consumers. It is 4 x 6 inches in size, bound in cloth and intended for distribution to those directly interested.

The plant of the Domestic Sewing Machine Co., of Newark, N. J., has been taken over by the Progressive Company of Torrington, Conn., manufacturers of small metal goods. It is said that the manufacture of gas and gasoline engines, w'nd shields and automobile accessories will be carried on. The factory is located at Orange and Warren Sts., and it will be in charge of C. H. Newton who has been in charge of the shops of the company in Torrington.

The polishing machines made by John C. Blevney, 216 High St., Newark, N. J., are made for the grinding and polishing of a large variety of small metal goods and with an economy of time and perfection of results not obtained in any other manner. The automatic machines for polishing small articles such as blanks or washers are particularly worthy of note as it is possible with them to polish hard or soft steel, brass, bronze, German-silver, nickel, or any other metal in the form of blanks, discs, washers or other flat objects that are usually so difficult to polish cheaply. When this machine is used, the articles are polished as rapidly as they can be fed into it by an operator. Cheap labor may be employed for the purpose.

The Otto Konigslow Mfg. Co., of Cleveland, Ohio, manufacturers of stamped sheet metal goods, have moved to their new plant at Perkins Ave. and East 35th. St.

The Comstock-Wellman Bronze Co., recently incorporated in Cleveland, Ohio, to make brass, bronze and aluminum castings are now located at 6017 Superior Ave., N. E., in that city.

At the meeting of the National Electroplaters' Association, held in New York City on March 5th., an interesting paper was read by George B. Hogaboom on "The Oxidizing and Coloring of Metals" in which a *resume* of a number of methods now or formerly in use was given and discussed.

The office of the Toledo Electric Welding Company has been moved from Toledo, Ohio to Cincinnati, Ohio where its factory is now located. This company manufactures electric welding machines and a new factory was recently erected at Knowlton and Langland Sts., in Cincinnati. An increasing demand for electric welding machines is reported.

At a recent meeting of the stockholders of the Michigan Copper & Brass Company of Detroit, Mich., manufacturers of brass and copper sheet, rods and wire, it was voted to increase their capital stock to $200,000 to increase the facilities of their plant. The directors elected are as follows: George H. Barbour, Jeremiah Dwyer, James A. Danaher, F. M. Alger, F. T. Moran, W. A. Gorby, E. J. Corbett, D. M. Ireland and James T. Whitehead. George H. Barbour, Jr., and W. A. Livingstone were also elected as two new members of the board of directors.

The Waterbury Wire Die Company of Waterbury, Conn., manufacturers of diamond and steel dies for drawing wire, are making a diamond emery wheel dresser for use in dressing emery wheels. For this work there is nothing so serviceable as a diamond as it has the necessary hardness for the work. In spite of the popular opinion in regard to the cost, it is not very expensive when its value is taken into consideration and may be purchased as low as $5.00. Emery wheel users should invertigate the matter as the diamond dressers are very satisfactory.

The Royal Chemical Company of Phenix, R. I., are now producing a number of excellent materials for use in the plating trades for the preparing and cleaning of work, both before and after electroplating. Among their products are "Natria" for the cleaning of all metals goods for plating and which does not tarnish the surface, even when polished, "Royal Potash Compound" for removing buffing dirt, for burnishing, both by hand in with steel balls in the tumbling barrel, and for the cleaning of metal work for plating. Another substance made is "Royal Alkali Powder" for cleaning Vienna-lime from polished work. It removes the lime and does not attack the surface.

A new plant, 330 x 400 feet, is to be built by the White Sewing Machine Company of Cleveland, Ohio.

A commercial laboratory has been opened by Robert Kann, consulting chemist to the Raritan Copper Works of Perth Amboy, N. J., at 24 Cliff St., New York City. A specialty of metallurgical analysis and research will be made.

The Standard Brass & Copper Tube Company of New London, Conn., are manufacturers of seamless copper and brass tubes in all commercial sizes and carry them in stock for immediate shipment. A specialty is made of iron pipe sizes of brass tubing for the plumbing trades.

The new shot tower of the Union Metallic Cartridge Company of Bridgeport, Conn., is now completed and the first trial was recently given it. Some 15 or 20 tons if shot were made in a successful manner. The company is to make their own shot for use in shotshells and of which they are the largest manufacturers in the United States.

Particular attention is called to the high-speed milling cutters made by the E. C. Bliss Mfg. Co., of Providence, R. I. They are made of a special steel so that a much greater speed than ordinary milling cutters will stand can be used. It is claimed by the makers that the cost of production will be cut down to twenty-five per-cent of former costs by their use. Immediate delivery is made of these cutters.

The Baird Machine Company of Oakville, Conn., manufacturers of tumbling barrels and automatic machinery, desire to call attention to the "Baird" Automatic, Four-Slide, Wire-Forming Machines which are made in six sizes and for working wire up to 3/8 in. in diameter and 15 inches long. A large variety of intricate wire shapes may thus be made upon it. Their bulletin on the subject will be sent upon request.

The sectional lacquering, japanning and enameling ovens made by Hermann Genrich, 69 Rutgers Slip, New York, possess exceptional merit and are extensively used. They are also used for baking cores. The ovens are made of galvanized iron and lined inside with asbestos. The ovens are made so that they can be knocked down for shipment thus saving freight charges and liability to damage during transit.

The Standard Rolling Mills, 363 Hudson Ave., Brooklyn, N. Y., supply britannia-metal and other soft metal sheets to the trade for stamping, spinning, drawing, etc. It is used by makers of silver-plated ware, coffin hardware manufacturers, novelty and badge makers, and many other makers of metal goods. The clean, bright surface of the metal, ease of working and plating render it particularly adapted for many purposes. The Standard Rolling Mills supply the sheet in any size or thickness that may be desired.

The Perfection Iron & Brass Bed Company has been organized in Seattle, Washington for the manufacture of iron and brass bedsteads. A factory has been established on Ranier Boulevard. The general manager is Joseph Duke.

The American Iron & Wire Works, 1622 Carroll Ave., Chicago, Ill., manufacturers of ornamental iron, brass and bronze work have made an assignment to David Oliver. The liabilities are named at $40,000 and the assets at $10,000.

I. H. Kleban of the firm of Kleban & Gelman, dry goods merchants of Bridgeport, Conn., has purchased the interest of G. A. Weld in the Weld Mfg. Co., of Bridgeport, Conn. The capital stock has been increased from $25,000 to $40,000, and the business and plant will be enlarged. The manufacture of buckles, fasteners and a large variety of small metal goods carried on as well as electroplating. Martin A. Heanue remains with the company as general-manager.

Personal.

L. G. Delamothe, the well known expert plater and specialist in the metallization of flowers, has severed his connection with the Delamothe Company of Spokane, Washington and is now located in Santa Rosa, California. He has established a studio for the metallization of Luther Burbank's specialties in horticulture and it is expected that some remarkable novelties for the fall trade will be turned out.

Obituary.

James Hendricks McAvity of T. McAvity & Sons, Ltd., St. Johns, New Brunswick, died in that city on January 16th. He was well known in the United States and had always taken a great interest in the brass foundry portion of the business which resulted in building it up to the high standard that it now has.

Seth E. Thomas of the Seth Thomas Clock Company of Thomaston, Conn., died in New York City on Feb. 6th. aged 68 years. He was a grandson of the founder of the company, and had done much to build up the company to its present magnitude. He was treasurer of the company at the time of his death. He is survived by a widow and six daughters.

Ambrose H. Wells, president of A. H. Wells & Co., of Waterbury, Conn., manufacturers of seamless brass and copper tubing, died at his home in that city on Feb. 15th, at the age of 72. At the time of his death he was also president of the Waterbury Rolling Mills of Waterbury, manufacturers of brass and German-silver sheet, and of the Waterbury Battery Co.

Current Metal and Supply Prices.

These Prices are net and are for moderate quantities. Smaller quantities command higher prices. Prices subject to fluctuation.

Acetone, pure, 98-99%	lb.	.22
Acid, Acetic, pure, 30%	lb.	.07
Acid, Arsenious (White Arsenic)	lb.	.20
Acid, Benzoic	lb.	.55
Acid, Boracic (Boric), pure	lb.	.12
Acid, Hydrochloric, see Acid, Muriatic.		
Acid, Hydrofluoric, 30%	lb.	.04
Acid, Hydrofluoric, 50%	lb.	.10
Acid, Muriatic, 20°	lb.	.02
Acid, Muriatic, c. p., 20°	lb.	.07
Acid, Nitric, 38°	lb.	.05⅝
Acid, Nitric, 40°	lb.	.05⅞
Acid, Nitric, 42°	lb.	.06¼
Acid, Nitric, c. p.	lb.	.08
Acid, Sulphuric, 66°	lb.	.01¾
Acid, Sulphuric, c. p.	lb.	.06
Alcohol, Wood	gal.	.50
Alcohol, Denatured	gal.	.55
Alum	lb.	.04
Aluminum, Sulphate	lb.	.06
Aluminum, Metallic, in Ingots	lb.	.23
Aqua-Fortis, see Acid, Nitric.		
Ammonia Water (Aqua-Ammonia), 20	lb.	.04¾
Ammonia Water (Aqua-Ammonia), 26	lb.	.06¼
Ammonia Water, c. p.	lb.	.08
Ammonium Carbonate, lump	lb.	.15
Ammonium Chloride (Sal-Ammoniac)	lb.	.12
Ammonium Hydrosulphuret	lb.	.30
Ammonium Sulphate	lb.	.07
Ammonium Suphocyanate	lb.	.50
Amyl Acetate	gal.	1.85
Antimony	lb.	.08½
Arsenic, Metallic	lb.	.15
Arsenic, White (Acid Arsenious)	lb.	.20
Argols, White (Cream of Tartar)	lb.	.31
Asphaltum, Commercial	lb.	.05
Asphaltum, Egyptian (Bitumen)	lb.	.30
Benzine	gal.	.15
Benzol, Pure	gal.	.75
Bismuth, Metallic	lb.	1.75
Bitumen, see Asphaltum.		
Blue-Vitriol, see Copper Sulphate.		
Borax, Crystals or Powdered	lb.	.10
Borax Glass	lb.	.35
Cadmium, Metallic	lb.	.70
Carbon Bisulphide	lb.	.10
Calcium Carbonate (Precipitated Chalk)	lb	.10
Chrome-Green	lb.	.50
Copper, Lake, (carload)	lb.	.13¾
Copper, Lake, (cask)	lb.	.14
Copper, Electrolytic, (carload)	lb.	.13½
Copper, Electrolytic (cask)	lb.	.13¾
Copper, Casting, (carload)	lb.	.13⅜
Copper, Casting (cask)	lb.	.13⅝
Copper Acetate (Verdigris)	lb.	.35
Copper Carbonate, dry	lb.	.25
Copper Sulphate (Blue-Stone)	lb.	.09
Copperas, see Iron Sulphate.		
Corrosive Sublimate, see Mercury Bichloride.		
Cream-Tartar, see Potassium Bitartarate.		
Cryolite	lb.	.12
Cyanide, see Potassium Cyanide.		
Dextrin	lb.	.15
Emery Flour	lb.	.04
Emery, F F & F F F	lb.	.03
Flint, powdered	lb.	.01
Fluor-Spar	lb.	.01¼
Fusel-Oil	gal.	1.75
Gold Chloride	dwt.	.60
Gum Copal	lb.	.30
Gum Guiacum	lb.	.26
Gum Mastic	lb.	.70
Gum Sandarac	lb.	.35
Gum Shellac, brown	lb.	.50
Gum Shellac, white	lb.	.60
Iron Perchloride	lb.	.25
Iron Sulphate (Copperas)	lb.	.05
Lead Acetate (Sugar of Lead)	lb.	.15
Lead, Pig	lb.	.04¾
Lead, Red	lb.	.12
Lead, Yellow Oxide (Litharge)	lb.	.12
Liver of Sulphur, see Potassium Sulphide.		
Manganese, Ferro, 80%	lb.	.10
Manganese, Metallic, pure	lb.	.75
Magnesium, Metallic	lb.	1.50
Mercury Bichloride (Corrosive Sublimate)	lb.	.93
Mercury, Metallic (Quicksilver)	lb.	.50
Mercury Nitrate	lb.	1.50
Mercury Oxide, yellow	lb.	1.80
Nickel and Ammonium Sulphate (Double Salts)	lb.	.16
Nickel Carbonate, dry	lb.	.60
Nickel Chloride	lb.	.50
Nickel Metallic	lb.	.49
Nickel Sulphate (Single Salts)	lb.	.25
Nitre (Saltpetre), see Potassium Nitrate.		
Oil of Vitriol, see Acid, Sulphuric.		
Paraffine	lb.	.15
Phosphorus, yellow	lb.	.40
Phosphorus, red	lb.	1.10
Pitch	lb.	.05
Plaster of Paris, Dental	bbl.	4.00
Platinum Chloride	oz.	14.50
Platinum Metallic	oz.	29.00
Potash-by-Alcohol, in sticks	lb.	.50
Potash, Caustic (Potassium Hydrate)	lb.	.08
Potassium Bichromate	lb.	.14
Potassium Bitartarate (Cream of Tartar)	lb.	.31
Potassium Carbonate (Pearlash)	lb.	.10
Potassium Chlorate	lb.	.15
Potassium Cyanide	lb.	.25
Potassium Iodide	lb.	2.25
Potassium Nitrate (Nitre or Saltpetre)	lb.	.10
Potassium Permanganate	lb.	.17
Potassium, Red Prussiate	lb.	.60
Potassium, Yellow Prussiate	lb.	.24
Potassium Sulphide (Liver of Sulphur)	lb.	.15
Potassium Sulphuret, see Potassium Sulphide.		
Potassium Sulphocyanate	lb.	.70
Pumice, Ground	lb.	.05
Quartz, Powdered	lb.	.01
Rosin, Yellow	lb.	.04
Sal-Ammoniac, see Ammonium Chloride.		
Sal-Soda, see Sodium Carbonate.		
Silver Chloride, dry	oz.	.75
Silver Cyanide	oz.	1.00
Silver, Fine	oz.	.50¾
Silver Nitrate, crystals	oz.	.50
Soda-Ash	lb.	.05
Sodium Biborate, see Borax.		
Sodium Bisulphite	lb.	.15
Sodium Carbonate (Sal-Soda), crystals	lb.	.02
Sodium Hydrate (Caustic Soda)	lb.	.05
Sodium Hydrate (Caustic Soda) by Alcohol (in sticks)	lb.	.45
Sodium Hyposulphite ("Hypo")	lb.	.04
Sodium Metallic	lb.	.90
Sodium Nitrate	lb.	.05
Sodium Phosphate	lb.	.09
Sodium Silicate (Water-Glass)	lb.	.04
Soot, Calcined	lb.	.15
Spelter, see Zinc.		
Sugar of Lead, see Lead Acetate.		
Sulphur (Brimstone) in lump	lb.	.05
Tin Chloride	lb.	.43
Tin, Metallic	lb.	.32½
Turpentine, Venice	lb.	.35
Verdigris, see Copper Acetate.		
Water, Distilled	gal.	.15
Water-Glass, see Sodium Silicate.		
Wax, Beeswax, yellow	lb.	.45
Wax, Carnauba	lb.	.70
Whiting (Ground Chalk)	lb.	.02
Zinc Carbonate, dry	lb.	.19
Zinc Chloride	lb.	.12
Zinc, Sulphate	lb.	.06
Zinc (spelter)	lb.	.05½

THE

BRASS WORLD

AND

PLATERS' GUIDE

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Obtaining a Fine Surface on Brass Castings.

Many brass or bronze castings are turned out upon which a good surface is unnecessary. Such work as car bearings, bushings, and similar work are smoothed by rolling them in a tumbling barrel and little time is wasted on the mold. Other kinds of castings, such as valves, plumbers' goods, gas-cocks, etc., must be fairly smooth in order to satisfy the customer. An extra fine or smooth surface, however, is unnecessary and is not obtained, as ordinary methods of molding give satisfactory results. The third class of castings are those known to the trade as "fine work" and the consumer demands the best possible surface, the smoother the better. The average brass founder does not possess the skill for the production of such work, although he may be a good molder and can do a nice job of the ordinary kind, but he has never been brought up in the surroundings of the very fine class of work.

Contrary to the usual belief, the production of a fine surface on brass castings does not call for French sand or a knowledge of false core work. In the ordinary brass foundry trade there is no demand for undercut castings, and all patterns are supplied with good draft. The requirements are as smooth a surface as possible and with as much detail to the design as can be obtained.

In the East, where the greater portion of fine brass castings are made, the following

method is used for the production of the work.

The pattern must be very smooth and free from "back" drafts or imperfect drafts. A good pattern is very essential. Ordinary iron flasks are used, as snap flasks are unsuited and are not employed for such work. The pattern is faced with a grade of sand known as "Windsor-Locks". This is a sand obtained from Windsor Locks, Conn., and in other sections of the Connecticut Valley. It is a fine, red sand that answers admirably for producing a fine surface. There are other sands in the United States which are also good, but this particular one is almost exclusively used in the East for such work.

The pattern, after being faced with the Windsor-Locks sand, is backed up in the usual manner with ordinary bench sand and the mold made in the usual manner. Lycopodium is generally used for the parting. When the mold has been made, it is skin-dried by placing its face against a stove. The mold is *not* dried clear through. The casting is made in the usual manner, either by pouring on end, as may be necessary for some thin work, or flat for others. The manner of making the mold is the same in either case.

Although a fine casting is produced from the mold made as described, a still finer surface is obtained by smoking the face of the mold, after skin-drying, with a gasoline or kerosene torch. The light coating of carbon thus deposited prevents the metal from adhering to the sand. For the best class of work, the molds are generally smoked. It is, perhaps, unnecessary to add that superior castings cannot be made from poor metal.

Barium Cyanide.

Barium cyanide is a substance which the future will probably find quite extensively used for regenerating silver plating solutions, and, perhaps, those of copper and brass as well. It is now being used in Germany, and with apparent success. In the United States it does not appear to have been used at all, although one of the leading silver platers states that he experimented with it at one time but the cost was too high to permit its being used. This is the condition at the present time, although if it can be used in Germany, it would seem that there must be some cheap producer of it there. Inquiries of the leading chemical manufacturers fail to disclose any further information although one cyanide manufacturer states that he will manufacture it if the demand is sufficient to warrant it. In this, however, the reverse will follow. Platers will use it if it is manufactured.

The advantage of barium cyanide in regenerating silver plating solutions is in the fact that, when added, it reacts with the potassium carbonate that is present in the solution (and which results as the potassium carbonate decomposes), and forms barium carbonate, which is insoluble and easily settles or may be filtered out, and potassium cyanide. In this way the ever increasing potassium carbonate may be decomposed and the solution returned to its original condition.

By the use of barium cyanide, a silver solution may last indefinitely as the regeneration is theoretically correct. In Germany, we have been informed, silver plating solutions are used many years without any apparent difference in results, and the use of barium cyanide seems to have been carried to such an extent that tables have been drawn up showing the quantity needed to decompose given amounts of potassium carbonate which analysis shows are present in the silver solution.

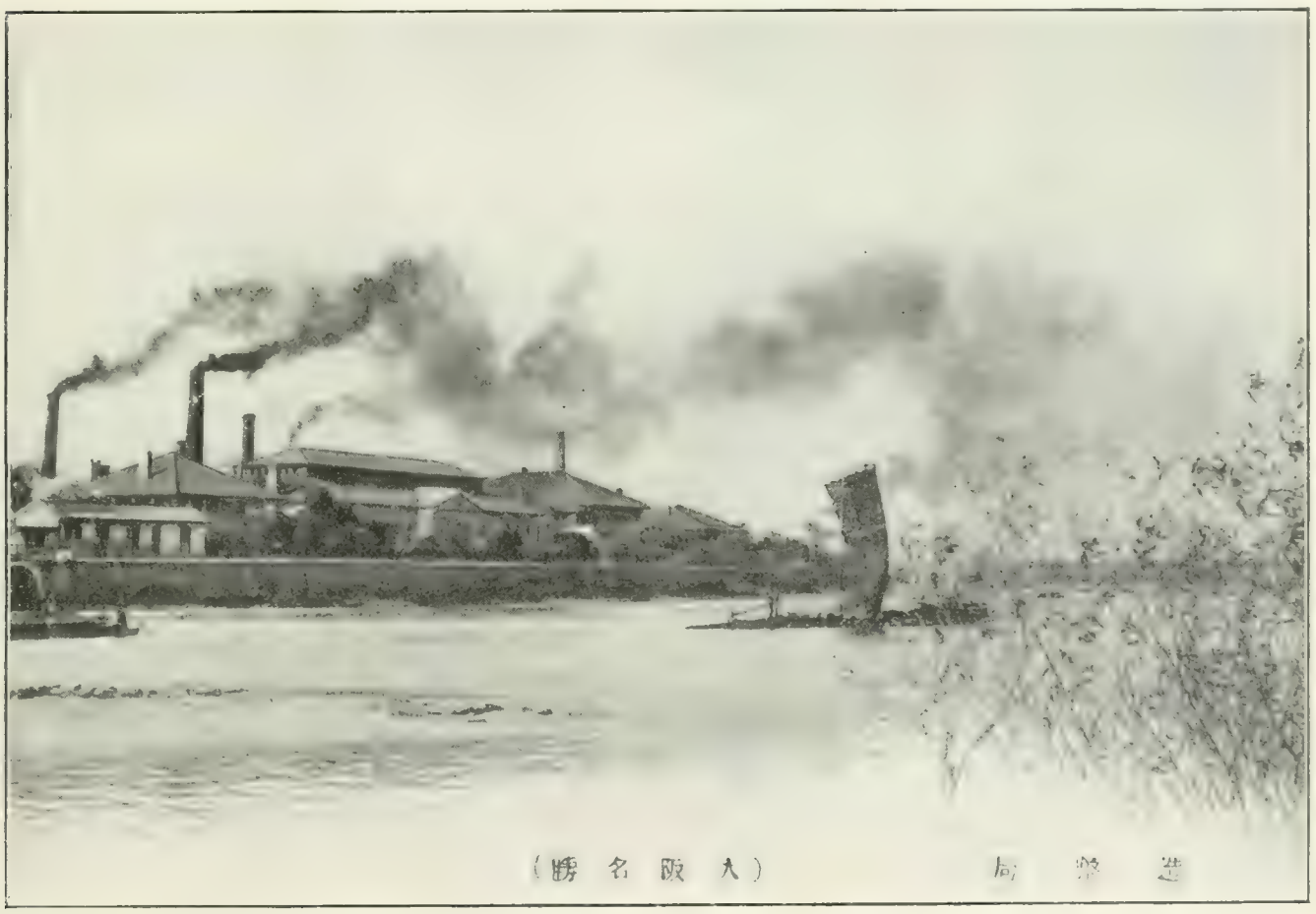
A German investigator, L. Lewin, doubts that metallic copper or its salts will produce chronic poisoning. As the result of a careful examination of copper workers, who had been engaged in the manufacture of copper for several years, it was found that occasionally acute disorders are caused by copper dust, but no instances of chronic poisoning were discovered.

According to an authority, it is estimated that the annual consumption of fusel-oil in the United States is between 450,000 and 500,000 gallons. Practically 80 per-cent is used in the manufacture of amyl-acetate, while the remainder is refined and placed on the market as amyl alcohol or "refined fusel-oil". The manufacture of lacquers consumes a large proportion of both amyl-acetate and fusel-oil.

The Imperial Mint at Osaka, Japan.

The city of Osaka is situated in the eastern part of central Japan and is one of the most important commercial centers in the Far East. It lies upon the banks of the Yodogawa, the river that drains Lake Biwa. A small island in the middle of the river divides it into two parts of about equal width. The city is intersected by numerous small canals which, it is often said, gives it the appearance of Holland although they have the objectionable feature of breeding disease caused, no doubt, by the imperfect drainage. The ancient name of the city of Osaka was *Naniwa* and those who recollect the formation of the first Japanese navy will remember that one of the most formidable and largest of the vessels in it was called by this name. Since then, other larger and more powerful vessels have outclassed it.

In population, Osaka is the second city in size in Japan and at the last census it contained a population of 996,000. The largest city is Tokio with a population of 1,819,000. It will be appreciated, therefore, that Osaka is one of the largest cities in the world and is practically the size of Brooklyn. From a manufacturing standpoint it seems to be the most important city in Japan, and it contains copper works and rolling mills, cotton mills and many other important industries that have sprung up in the country within the past ten years during which time Japan has made such rapid industrial progress. Among the important industrial works in Osaka is the Imperial Mint in which the coinage of the country is manufactured. A photograph of the Mint is herewith shown and indicates that it is a plant of considerable magnitude and one which reflects credit upon the industry of the Japanese.



The Imperial Japanese Mint at Osaka, Japan.

The Mint was organized in 1871 by a staff of British officials, but has been under the management of Japanese officials since 1889. In addition to the Mint proper, the plant contains a sulphuric acid works, a gold and silver refinery and parting plant. The melting at

the Mint is done in graphite crucibles obtained from England, and the fuel is composed of charcoal. Otherwise the operations are about the same as those conducted in our own country. The rolling mill machinery is mainly of English make, although some of the coinage presses and other machinery was manufactured in the United States.

Photographs of Japanese plants are difficult to obtain and in many instances impossible. Fortifications and Government works are forbidden and one who attempts to photograph them is sure of arrest if detected. Interior views of manufacturing plants are extremely difficult to obtain and are guarded even more jealously than in our own country.

For the accompaning photograph we are indebted to H. H. DeLoss of Bridgeport, Conn., who recently made a tour of Japan and inspected the Mint.

Melting Yellow Brass Chips.

As the quantity of brass screw rod used is now more than ever before, the amount of chips produced is correspondingly large. This material is the great source of supply for brass ingot makers and it is a good one, too, and no better material can be obtained for the purpose. A concern that uses screw rod chips exclusively for making its ingot, usually turns out a good one as the material is free from iron (or easily freed by a magnet machine) and the metal in it is of good quality.

Some brass founders purchase brass chips for their work and the complaint is often heard that the loss in melting is very large. In a recent instance, a brass founder claimed that he could not melt the chips without a loss of 15 or 20 per cent. While such an excessive loss will occur, if the chips are melted carelessly or not treated in the right manner, it is possible, when care is taken, to keep the loss down to 5 per cent and less. The right method of melting such yellow brass chips is as follows:

Use a large crucible for the melting. A small one is not satisfactory on account of the labor involved in charging and the mechanical loss of chips occasioned by their falling over the sides of a small crucible when they are put in.

Use a funnel-shaped charging device for putting the chips into the crucible. This is used by nearly all of the foundries and rolling mills that have chips to melt. It is a piece of sheet iron made into the shape of a funnel so that it can be inserted in the crucible and have the end project above the top of the furnace. The bottom of the device is made about the size of an ordinary stove-pipe and the top is flared out a little so that the chips may be poured down it into the crucible without spilling. It has a handle on the side so that it may readily be lifted out.

When commencing to melt, do not fill the crucible with chips or the loss will be large. The method usually followed is to leave a certain amount of metal in the bottom of the crucible as a "button" after the last pouring has been made the day before. The button is then allowed to melt, and the chips stirred in to it. The idea is to have the bath of molten metal dissolve the chips at once and not allow them to reach a red heat or melt by themselves. There is so much surface exposed to oxidation when the chips are melted alone, that the loss is heavy, but if the bath of molten metal is allowed to dissolve them, they melt before there is any opportunity to oxidize. This is one of the most important points in the melting. When carefully followed it is possible to keep the loss down to a low amount.

Keep plenty of charcoal on the crucible while melting as it will prevent oxidation and also the waste of spelter. The spelter does not volatilize as readily when the brass is kept covered with charcoal. Stir the metal frequently so that all the chips are dissolved by the molten metal and are not left at the top of the crucible to oxidize and waste.

The heat of the metal is important. If too high it will cause rapid volatilization of the spelter. At the same time, the metal in the bottom of the crucible must not be too cold or it will become chilled when the chips are added. When the button in the bottom of the crucible is first melted, it should be heated so that the spelter begins to volatilize slightly, when the chips are at once stirred into it. Care must be taken not to add too many chips so that the mass becomes chilled, but as soon as it begins to thicken, stop. Allow to heat again and then add more chips. Carry this on until the crucible is filled.

A handful of common-salt thrown on the surface of the button before the melting begins will serve to clean the metal and give a good, clean ingot.

The Importance of Cleaning the Anodes in Brass Plating.

In brass plating there is no more important feature than the attention which must be paid to the cleaning of the anodes. Many a plater has believed that the cause of his poor brass deposits has been the cyanide, current or salts when, in reality, coated anodes were at fault. It is one of the most common difficulties in working a brass solution, and one so few platers seem to think about. At the same time, it is very readily overcome.

Of all the plating solutions in common use, the metal is given off from the anode in a brass solution the least readily. For this reason a brass solution is never self sustaining, but copper and zinc salts must be regularly added to it in order to preserve its proper balance. Some platers use copper anodes in a brass solution and it is good practice for the reason that copper is more readily dissolved than brass and the solution is then fed regularly with the copper, and zinc salts only need be added. The majority of brass platers, however, use brass anodes.

In brass plating the use of too much free cyanide is objectionable, and it may be said that hardly a sufficient quantity can be used to keep the anodes clean. If a large quantity of free cyanide is used, the deposit is thin and the work gases freely with the accompanying blistering of the work. It is the aim of good brass platers, therefore, to have just as little free cyanide in the solution as can be employed and yet keep the anodes from becoming coated for a *reasonable* length of time. If enough is used to keep the anodes clean for *all* time, then it may safely be assumed that a good brass deposit cannot be obtained. How long is considered a reasonable length of time for the maintenance of the anodes in a clean condition will depend upon the solution and the manner in which it is worked. If worked "hard", the anodes will coat over more rapidly.

An anode slightly coated over is not as pronounced in its action on the deposit as one heavily coated. In either instance, however, the effect is to impede the passage of the electric current, and to hinder the dissolving of the anode itself. In the first case, or that in which the anode is slightly coated, the current is slightly impeded, but the deposit follows somewhat irregularly on account of the constantly decreasing current strength. The color of the deposit is apt to suffer and finally, when the current becomes quite weak, copper only is deposited. In the case of the anode heavily coated, the current almost ceases and the work turns black in the solution. If it does not quite stop, then the deposit is often multicolored; i. e., copper, zinc and brass on the same article. Let the following complaint from a plater who had difficulty with his brass solution be taken as a typical example of what inattention to the cleaning of the anodes will do.

Anode Used in Brass Solution and Covered with White Coating which Stopped the Current

"My brass solution has worked all right for some time, but yesterday the deposit seemed too red and I added quite a quantity of carbonate of zinc in order to bring it to the necessary yellow color. It was then too light or pale in color so I added some carbonate of copper in order to bring it back again. This I succeeded in doing, but within a short time, the articles that I was plating (cast-iron lamp bases) began to show several colors on the same surface, and then the gas ceased to come

from them until the whole article turned a dark and dirty color. I could do nothing with the solution at all."

Investigation of the difficulty proved that all that was needed was the cleaning of the anodes and the addition of more cyanide. Contrary to the rule of adding "metal" to a brass solution, he had added the carbonates of zinc and copper directly to the solution when he should have dissolved them in cyanide previous to such an introduction. He had, therefore, taken up most of the free cyanide in the solution so that there was very little left to keep the anodes clean. The coating on the anodes became thicker and thicker as the electrodeposition followed until it became so dense that the current could not pass.

Even in a well regulated solution the anodes coat over in time and they should be frequently cleaned in order to obtain the full value of the current and an even brass deposit. In barrel plating it is often necessary to clean the anodes every day, while in still solutions less frequent cleaning is required. A plater should watch his anodes carefully and clean them whenever it is necessary, be it every day or every week and thus interpose no barrier in the way of the current. Let it be the rule to have just enough free cyanide present to keep the anodes clean for a reasonable length of time and by cleaning them often less free cyanide can be used.

A badly coated brass anode means that either there is a deficient amount of free cyanide present or that it may have been left too long without cleaning. If they coat over in a few hours, it signifies that more free cyanide must be added. Whenever a brass solution works badly the anodes should *always* be cleaned and replaced, the solution again tried and the results noticed. If the deposit is then unsatisfactory the solution must be doctored, but the anodes are very frequently the only cause of trouble and should be attended to first.

In the illustration herewith shown is a brass anode that was used in a plating barrel and which became heavily coated over with a white material resembling white lead in appearance and completely impeding the current. It showed a deficiency of free cyanide and when an additional amount of cyanide was introduced, the coating did not make its appearance again.

In conclusion let it be said that in case a brass solution does not give a satisfactory deposit, invariably clean the anodes and then, if the deposit still remains imperfect, it will be known that the anodes themselves are not to blame. It is really the right treatment to make a diagnosis of a disease discovered in a brass solution and it will always be followed by an ultimate solution of it and its final cure.

The Deterioration of Solder.

While it is generally supposed that solder does not change with age, a simple experiment will serve to indicate that it does. Melt a piece of solder that has become oxidized on the surface, either from age or exposure to damp air or both. It will be discovered that the metal is covered with a film of oxide and that it does not flow freely. Wherever it runs a trail of oxide is left behind it. Now try a piece of freshly made solder and the difference will at once be noticed. It will flow freely and without the film of oxide found on the other metal.

The phenomenon seems to be one of simple oxidation, and is not confined to the tin and lead alloys alone, but even pure tin is subject to it although not as readily. When moist air comes in contact with it, the oxidation is much more rapid and pronounced, but in time the simple exposure to ordinary atmospheric influences will cause sufficient oxidation to prevent a good clean melt being made.

In soldering by the regular method, where chloride of zinc is used for the flux, this oxide film is usually dissolved to a greater or less extent, so that it is usually not particularly noticeable unless the solder has deteriorated to a considerable degree.

While the question of the deterioration of solder is not an especially important one, it was recently found that in one instance a sample of solder that had "aged" had every indication of a very poor mixture although analysis proved it to be practically half tin and half lead.

It has been found by Edison, during his experiments in the manufacture of his storage battery, that cobalt shows more tendency to curl up when electrodeposited as a thick coating than nickel.

Correspondence.

The Failure of Brass Locomotive-Tubes.

Editor:

In your report of my paper on "The Failure of Brass Locomotive Tubes" in the February issue of THE BRASS WORLD, you announce that I have made a reply to the criticisms offered by Dr. Rosenhain and others. This is not the case, because I intimated that I would reply fully in writing. It will prevent misunderstandings if you will kindly permit me to state that before the use of the untreated Birmingham water (which is upland surface water containing peaty matter), the average life of boiler tubes was from three to four years. While using the untreated water the average life was only eight to ten months of tubes made by the same makers and treated in precisely the same manner in so far as stoking was concerned. This fact is quite sufficient to disprove that the breakdown I have investigated was due to erosion caused by the blast, in which particles of clinker and coke were suspended.

The next point is the composition of the scale, which is just what one may expect from the decomposition of peaty waters containing mineral soaps. The low heat conductivity of the scale is, to say the least, remarkable and what one would expect from its composition.

T. Vaughan Hughes.

150 Edmund St.,
Birmingham, England.
Feb. 28th, 1910.

The Dry Method of Using the "Hill" Barrel.

While the wet method of using the Hill barrel for washing brass foundry ashes, skimmings, slags, etc., and recovering the metal from them is preferable to the dry process, there are many instances in which either water cannot be obtained in sufficient quantity, or it is too costly. This is found in many cases, particularly in large cities. The dry process, however, is being successfully carried on in many establishments, and while the metal obtained does not have as good an appearance as that produced by the wet method, it is equally as valuable.

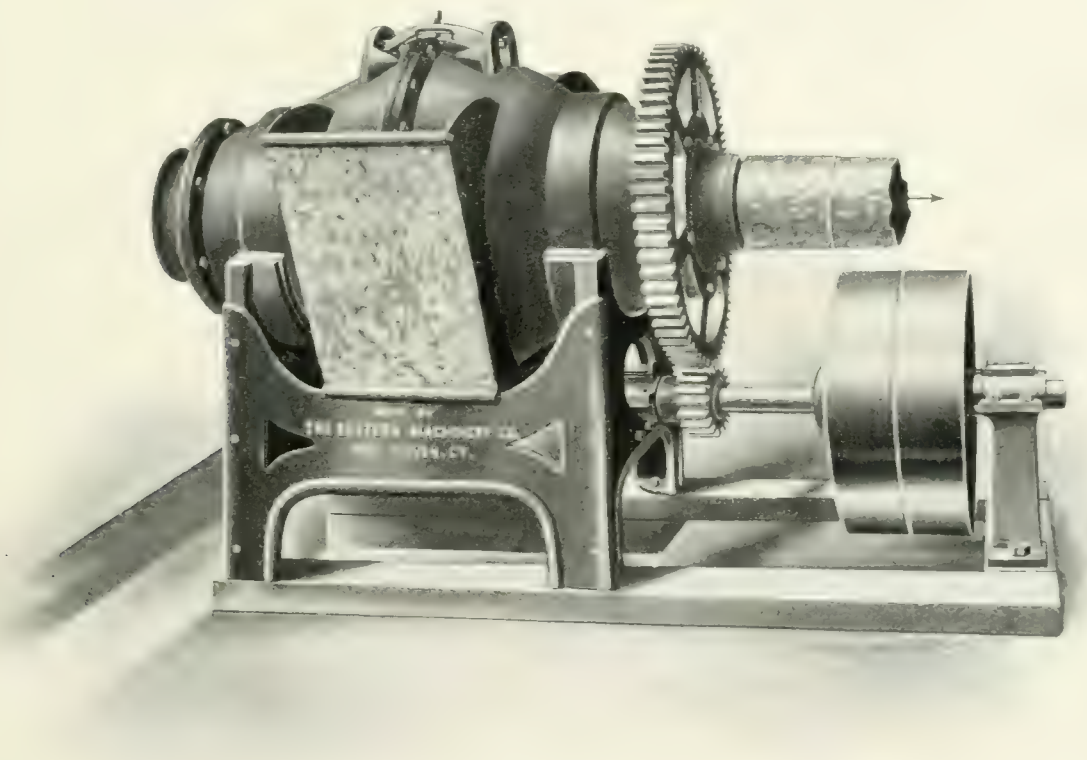


Fig. 1. The "Hill" Cinder Crusher Arranged for Treating Brass Foundry Ashes by the Dry Method.

In treating brass foundry ashes by the dry process, they should first be allowed to dry. If placed in the barrel wet or damp, they are apt to clog it up and the dust cannot be exhausted. The drying, however, is not a difficult operation, and as the ashes are originally dry, they will remain so unless stored in a

wet place or left in the open air where rain will fall on them.

The barrel used for the dry process is the same as that used for the wet method with the exception that an exhaust pipe of good size is attached to it at the rear end in place of the water pipe used in the wet grinding. This pipe is connected with an exhaust fan so that the dust is exhausted as rapidly as it is formed. The intake or charging end of the barrel allows the necessary amount of air to enter.

1 connected for the dry process, but the small size may be adapted in the same manner. The ashes are ground up so that the earthy matter, coal and cinders are pulverized so finely that they are sucked out by the current of air. If the dust which forms in the chamber used for collecting is objectionable, steam, either live or exhaust, may be used for moistening and precipitating it. As the chamber is placed in the open air or in other isolated locations, the use of the steam is not always necessary.

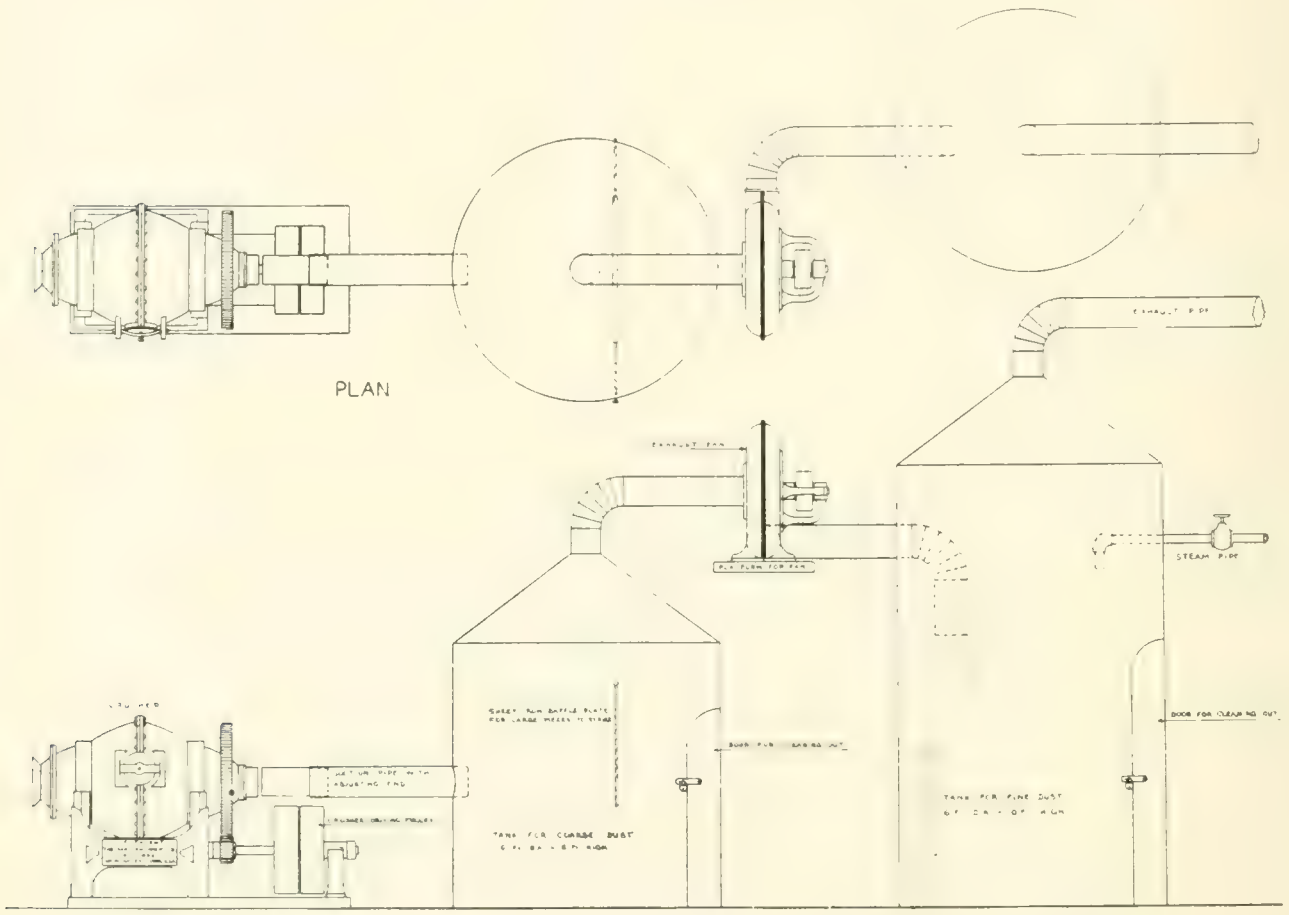


Fig. 2. Sketch of the Manner of Connecting the Crusher for the Dry Method.

The exhaust pipe is connected with a chamber made of wood or sheet iron, and into this the coarse particles of material drawn out will enter, while the fine dust passes through the fan connected with the chamber. The manner of connecting is shown in Fig. 2. The amount of air pressure can be regulated by the speed of the fan or a slide gate so that the dust will be exhausted as rapidly as formed. Too great an air pressure is not advisable as it will suck out the fine particles of metal, while one too light will not remove the dust. The necessary amount, however, is easily determined.

The large size Hill barrel is shown in Fig.

Zinc-dross usually contains from 2 to 4 per-cent of iron which raises the melting point of the mass so that it becomes thick at the temperature of molten zinc. When the iron in the zinc reaches 2 per-cent, the metal becomes too thick to flow readily and is ladled out of the galvanizing kettle. The iron in zinc-dross is introduced from the galvanizing kettle and from the ladles used. The iron or steel which is galvanized also introduces a small quantity. The kettle is the chief source of the iron as it is in direct contact with the fire and the action of the zinc is then more rapid on the hot bottom.

Hints Upon Economy in the Polishing and Buffing Room.

By Joseph H. Hansjosten.*

Tell a man that he can save money by reducing the speed of his polishing or buffing lathes and he will, in many cases, smile at you and shake his head; and possibly inform you that the amount of work his men do depends upon the speed of their machines upon which they work. In a measure this is true and common sense tells us that it is useless to attempt to do good buffing on a lathe running at 1200 or 1500 revolutions a minute and do it as rapidly as it should be done. But in this seemingly unimportant matter of speed, a little study and time will save many dollars in the course of a year. Usually the pulley is put on the shaft and the buffing lathe is run at 3,000 or more revolutions a minute. A man is put to work, and as long as the amount and quality are right, no further thought is given the matter; and right here is where it is time to do a little thinking and figuring.

Power is a steady source of expense, and the greater the speed at which a machine is run, the more it costs to run it. Now if work can be done as well on a buffing wheel running at 2300 revolutions a minute as it can upon running at a higher speed (and experience has taught me that it can) is it not a waste of money to run them higher than the last named figure? In short, for all ordinary work and I am strongly inclined to say for all work, a buffing wheel should not run more than 2200 or 2300 revolutions a minute.

Just to illustrate one instance of reducing speed on buffing lathes without reducing the amount or quality of the work, I had the speed of one of three lathes reduced from 2800 to 2220 revolutions a minute without informing the men working upon the machine about it. At first, the men did not notice the difference, but they did notice that their wheels balanced better and the machine rattled less, causing less vibration of the floor. It was also noticed that they used less composition for the same amount of work than when the machine was run at a higher rate of speed. Isn't this little matter of composition of some importance too? I attribute the fact that less composition was used to the lower speed. It is reasonable to suppose that composition will adhere better to the wheel and is less liable to be thrown off at the lower speed than at the higher one.

For coloring nickel plated brass goods, which require only a very slight pressure when held against the wheel, a machine running at 1900 or 2000 revolutions will do as well as one running at a higher or greater speed.

What I have said about the speed of buffing lathes can also be said of polishing lathes. For any polishing machine, 1700 revolutions is high enough; and even a greater saving can be made by running the machine at the proper speed than in buffing. The rattling of the machines to pieces, the wearing out of the bearings and the shaking of the floor so that a man can scarcely stand upon it, can all be reduced to a minimum by running the polishing machines at the right speed.

In looking over many little wastes in polishing or buffing rooms, I have found that perhaps the greatest of them is the time lost by workmen "sawing" away on buffs 5 or 6 inches in diameter, and trying to get out as much work as could be done upon a larger wheel. Yet in many plants a buff must last the workman a stated length of time. This is the poorest kind of economy. Even in piece work shops this should not be tolerated for both quantity and quality of work are sure to be influenced; and it should always be borne in mind that the more work there is done in a given time, the cheaper it is done, whether the workman is upon day or piece work.

I do not mean to say that buffing wheels should be thrown away when worn down to 6 or 8 inches, but nearly every shop has small work to do which can be done to advantage on very small wheels. Give the workman a new wheel when he needs it, use the old one where it can be used to an advantage, and you will be the gainer by it. Small wheels, in fact, very small wheels, made of either loose or stitched buff sections, can be used for coloring when they become useless for any other purpose.

A great saving may be made in purchasing buffs. Many men never buy a buff section that is larger than 10 or 12 inches. A 10 inch buff section will make just as large a stub or hub

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as a 16 inch one, hence there is just as much waste in a small buff as in a large one; but the larger buff, although costing more in the first place, lasts longer, and when new, will do more work in a given time and fewer hubs will go to the boiler room.

"Galvanite"; A Self Plating Material.

A material called "Galvanite" is now creating a large amount of interest in England and is being placed on the market there. It is used for electroplating various kinds of metals on a metallic base by the simple operation of rubbing on with a rag, in the same manner as followed with the old silver plating paste used at one time for silvering. The "Galvanite", however, is made for plating a number of different metals and up to the present time silver, tin, nickel and cadmium have been deposited. The material is rubbed on the surface to be plated and a deposit is at once formed. The value of the material has been well demonstrated and what is claimed for it seems to be true. How heavy a deposit can be put on remains to be seen, but it is probable that a thin coating is all that can be obtained.

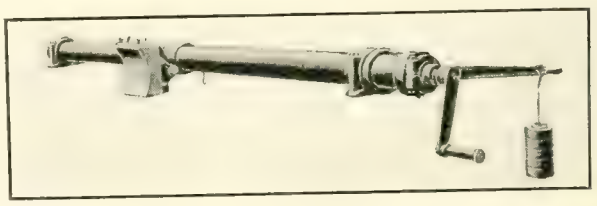
Samples of the material have not yet been distributed to any extent, but as far as can be ascertained the following description in one of the English journals explains the composition quite well:

"The metal to be deposited is in the form of a powder and is mixed with a quantity of dry chalk and a salt of the metal for the electrolyte. The whole is mixed dry and then moistened before applying to the metal to be plated. If, for example, nickel is to be deposited, it is powdered and mixed with chalk and powdered double nickel and ammonium sulphate. This mass is moistened and applied to the article to be plated. Commenting upon the theory of the process, the English contemporary states that the metal in the form of the powder constitutes the anode, the salt the electrolyte and the article to be plated the cathode. The finely powdered electro-positive metal makes innumerable contacts with the cathode surface and acts as so many minute anodes. These innumerable anodes gradually dissolve setting up an electric current. The current is small, but sufficient to deposit the metal."

The process is one that appeals to the ordinary observer as almost a revolution, but like many other easy and time-honored methods of plating, there will undoubtedly be numerous objections found and it is doubtful whether it will affect the electroplating industry to any extent, but rather become a substance for household use.

An English Device for Grinding Chilled Rolls.

An English device for grinding chilled iron rolls is herewith illustrated. It recently made its appearance upon the market and is intended for use in grinding the rolls while in the housings. In the ordinary practice of roll grinding, when the rolls are in the housings, it is customary to use a stick of hard wood for doing the work. This is held with the hands between the rolls and emery



English Roll Grinding Device.

and oil applied. As the rolls revolve, the grinding is done. The use of the stick of wood allows the grinding to be done in one place more than another so that a "crown" may be put upon the rolls when desired.

By the use of the device herewith illustrated, it is possible to approximate the stick of wood in the grinding, so that for many purposes, it may be used with good results. It is fastened to the housings and a grinding block is forced against the roll by means of the counterbalance. A feed screw serves to move the grinding block to and fro as desired.

The peeling or curling-up of nickel deposits when they have become quite thick, is caused by the occlusion of hydrogen gas during the electrodeposition. When the thick deposit is heated to redness, the gas is expelled and soft nickel is produced. Electrodeposition in hot nickel solutions gives nickel deposits with less hydrogen gas in them than those obtained from cold solutions.

The Chemist in the Brass Foundry.*

By W. M. Corse.

The statement recently has been made that the 20th. Century is going to be the era of the chemical engineer, as the 19th. was of the mechanical engineer. One has but to look about him to see evidences of this development to realize the truth of this statement. More and more of our manufacturers are coming to see that the underlying principles of their processes are chemical and that a knowledge of these principles is essential to the proper conduct of their business, if it is to be run at a profit. The brass manufacturers have begun to see this condition and the number of testing laboratories that have been installed in connection with this industry are proof of this fact.

I have had the good fortune to install four chemical laboratories, three of which have been in connection with brass foundries. A short history of their development may be of interest. The first came into being because of the trouble the manufacturer was having with metal melted in oil furnaces. The furnaces did not use a crucible, and the flame came in direct contact with the metal. Oxidation of the metal was greater than in the old style crucible coke furnace, and the composition of the mixture was varied to such an extent that very bad results were obtained from the castings when they were subjected to hydraulic pressure. My first work was to ascertain the amount of this oxidation and volatilization in order to maintain the composition of the resulting alloy uniform. Numerous tests were made and it was found that 35% more zinc was lost than was allowed for. It was also found that all the remelt was put into one general pile and as this amounted to 50% of the melt, the indiscriminate use of this remelt changed the formula very materially. One thing led to another, until finally all formulas for metal were made up in the laboratory and the resulting melts were analyzed regularly to see if these formulas gave the desired result. This all may seem very simple and undoubtedly is, but the fact is that the majority of brass founders are in ignorance of just these principles of their daily operation. The last seven years have witnessed remarkable strides along such lines as described, so that some foundries now know considerably more about metallurgy than they did before the chemist was employed.

Many times I have been asked the question: "Of what use is a Chemist to a Brass Foundry?" This question was asked by men actually operating foundries. To-day the number of analyses made is probably 500 times as many as five years ago. Although the manufacturer may not have come to the point of using the chemist, he is generally willing to concede his value.

From testing the furnace products for formulas I worked to examine the raw materials for purity. These include copper, tin, lead, zinc, ingot brass, scrap brass and sometimes antimony. Aluminum also comes in prominently for some kinds of work and has to be tested. The majority of aluminum casting makers buy their alloys ready made as it were, so that less work is done on their component parts than on finished alloys.

The cost of an alloy is of course determined by the cost of its components, and when these vary quite widely in price, a variation in composition sometimes means the difference between profit and loss. For instance, copper costs now about 14c per pound and zinc and lead average 5c per pound. An alloy figured for 70% copper, but actually carrying about 72% will cost 18c a hundred pounds more than it should. On a weekly melt of 100,000 lbs. this means $180.00 a week, or $9360.00 a year. This is by no means an unusual instance, and goes to show what a very small saving per pound may mean. It also shows how the exact control of a formula may save money for the manufacturer. It is safe to assert that over a thousand pairs of metals have never been alloyed, and many times this number of combinations of three or more metals have never even been thought of. The surface of this enormous field has scarcely been scratched and offers as much promise for investigation as any that I know.

If any industry needs the attention of the technical man, it is the foundry business. Rule of thumb methods predominate and opportunities for investigation lie at every hand.

In addition to the metallurgy, we have the

*Presented at the March meeting of the Chicago section of the American Chemical Society.

various refractory materials and their connection with furnace design and upkeep. They comprise such things as fire brick, fire clay, fire sand and carborundum. The various molding sands come in for attention too. These should be tested for fineness, binding qualities, resistance to hot metal, porosity, etc. Core sands are tested for fineness and refractory qualities. Crucibles are an important item of expense and should be tested regularly to insure maintaining uniform quality.

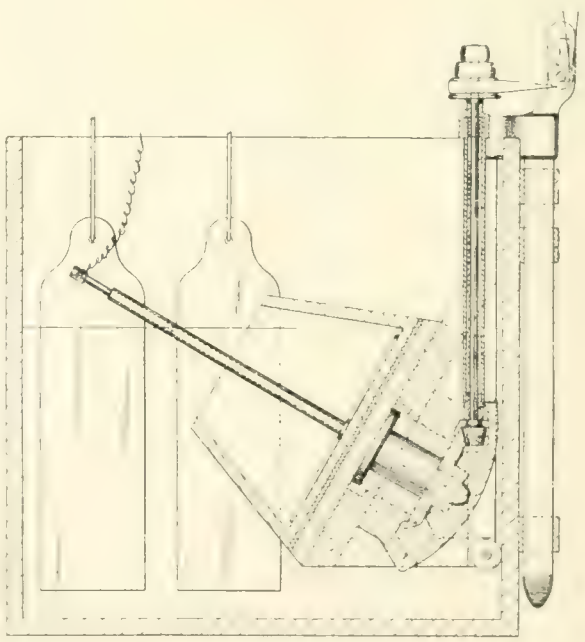
Coke can be tested for ash and sulphur, although a practical test for burning qualities is generally the most important. If oil is used for fuel, it also comes into the laboratory for test.

All brass foundries have copper bearing refuse of various kinds, which cannot be worked up satisfactorily with the equipment generally available. In order to sell these for anything like their proper value, it is necessary to know either their metallic contents, or their copper contents, which again makes work for the chemist. As a general thing experimental work cannot be properly taken care of by the foreman. The nature of his duties prevents him from giving concentrated attention to any problem for any great length of time, inasmuch as continued interruptions render impossible the proper recording of his observations. The chemist is, therefore, the logical man to conduct this kind of work. It usually happens that the chemist is the only technical man around the foundry, so that it properly falls to his lot to record the results of all tests made, whether they are chemical, physical, or practical tests of material. He often can be of help in devising production records, loss reports and summaries of such things as pounds produced per man per day, fuel consumed per 100 lbs. of metal melted and others too numerous to mention. He can do the planning for engineering work such as is commonly required in a foundry and can aid in the solving of such engineering problems as may arise.

I think I have made it sufficiently clear how a chemist can be used to advantage in any brass foundry large enough to warrant the outlay for a laboratory. For smaller foundries the commercial testing laboratory is available and does very satisfactory work along some lines. Experience has shown me that many foundries would employ their own metallurgist, as the brass foundry chemist may properly be called, did they but realize the many uses to which his services could be put. In my position as Secretary of the American Brass Founders' Association, I have had exceptional opportunities to watch the development of the brass foundry laboratory and I have observed that the manufacturers who are making the highest quality of goods in a business like manner, are foremost in utilizing this department. Could the practical foundryman be made to realize that a technical man makes his own position more valuable, and that co-operation vastly increases his own usefulness, a great step forward would be taken in this ancient and intensely interesting industry.

An English Plating Barrel.

A form of plating barrel has been patented by Thos. A. Smith and Thomas Deakin of Walsall, England, (U. S. Patent 951,662, Mar. 8, 1910). It has for its essential feature the fact that the barrel itself may be r eadily detached from its support without in any way affecting the driving mechanism. The barrel is in the form of the well known horizontal tumbling barrel and is driven by a vertical shaft as shown. The attachment at the side of the tank is used for holding it and driving mechanism to it.



English Plating Barrel.

Compound Copper and Steel Billets.

The problem of making a compound copper and steel billet has always been a difficult one and has been the subject of many experiments and much fruitless labor. The attraction of the problem has been strong as the demand for such a product in the electrical industry is large.

Fig. 1. Section of Compound Steel and Copper Billet.

The first method of producing such a billet was by pouring copper around a steel core and then rolling into sheet or wire. The copper, however, does not adhere to the steel in such a process, and when rolled, the two separate. Various other methods have been tried but without much success.

William M. Page of the Duplex Metals Company of Philadelphia, Pa., has discovered, however, that the difficulty of non-adhesion between the copper and steel is caused by the oxidation of the steel while the molten copper is brought in contact with it. In order to overcome this trouble, the steel core, around which the copper is cast, is given a thin coating of zinc. The method of coating the steel core is first to sand blast it, and then pass the vapors of zinc around it while out of contact with the air. As no oxygen can be present while the vapor of zinc is in the vessel containing the steel core, it becomes coated without oxidizing. The copper is then cast around the core by the process that has been found adapted for the work.

That the union between the steel and copper is a strong one is evidenced by the accompanying photographs of copper coated steel billets made by the aforesaid company. In Fig. 1 is shown a section of a billet cut off on a lathe and illustrating the principle of the process. The relative thickness, however, of the copper and steel may be varied to any reasonable proportion and the one shown is taken simply as an example. In Fig. 2 is shown the same cross-section of the billet

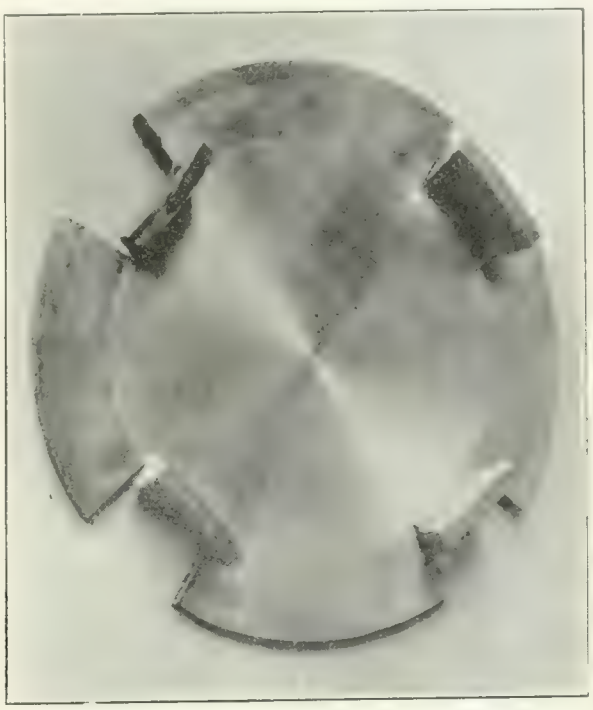


Fig. 2. Section of Billet Showing Adhesion of the Copper to the Steel.

with slots cut in it and the copper portion bent up. The object was to have the bend take place at the junction of the copper and

Fig. 3. Microphotograph Indicating the Firm Union of the Copper and Steel.

steel. The fact that the copper and steel did not tear apart during the bending is noticeable.

In Fig. 3 is shown a microphotograph of a section of the billet taken at the point of contact between the copper and steel. The firm union between the copper and steel is noticeable and indicates that the process is not one simply of coating the steel billet, but of actually uniting it superficially with the copper. With such a union, therefore, there is no separation of the copper and steel when rolled.

Dip Brassing Without Using the Electric Current.

The following method of producing a color similar to brass on iron or steel goods was first described by Roseleur and has been more or less used ever since. For cheap work it may do very well, but the deposit is quite thin and it does not wear well. For tacks, nails, etc., it can be used if desired as it is very cheap. The method of producing the brassing is as follows:

Make up the following solution:

Water	2 gallons
Copper sulphate	1 oz.
Tin chloride	1 oz.

The copper sulphate and tin chloride are dissolved in the water and the solution is then ready for use. It is used *cold*.

The articles to be brassed should be well cleaned from grease and rust by pickling or rinsing in potash. They are then carefully rinsed and immersed in the solution. The brass color forms in a few minutes and when it arrives, take the articles out and thoroughly rinse and dry. Do not leave them in the brassing solution any longer than it is necessary or the surface will become dead and gray. To work well the solution must be used cold. When heated a dark and dirty deposit is produced.

Small articles may be brassed satisfactorily in a basket. For quantities, a tumbling barrel may be used, but more water should be used or the deposit will be too rapid.

The deposit that is produced is, in reality, a bronze and not a brass although it has a light color closely resembling brass. By varying the proportions of the copper sulphate and tin chloride the color of the deposit may be changed. More tin chloride produces a whiter color and more copper a redder shade.

Roseleur says that at one time iron pins were brass plated in France by this process.

Use of Manganese Bronze for Valves.

Manganese-bronze, or any similar alloy containing aluminum, is difficult to use for making valves or other similar objects to stand pressure. Although the castings are strong, they show porosity and leak when pressure is applied. Walter Rübel of Vienna, Austria, who has done considerable work on aluminum alloys, claims that the use of nickel, in combination with the manganese, iron and aluminum in the manganese-bronze, will increase the density to such an extent that the valves will stand a high pressure. The use of the nickel, he claims, also increases the elastic limit. The manganese-bronze mixture is made in a peculiar manner, which, he claims is necessary for the success of the process. In the first place a preliminary alloy is made consisting of 2 atomic weights of copper (or 126 parts), 2 atomic weights of iron (or 112 parts), 3 atomic weights of nickel (or 175 parts), 1 atomic weight of manganese (or 55 parts) and 1 atomic weight of aluminum (or 27 parts). These proportions when calculated in per cents are as follows:

Copper	25.46 %
Iron	22.63 %
Nickel	35.35 %
Manganese	11.11 %
Aluminum	5.45 %

The metals are melted together and poured into ingots. This is called the "alloy". To make the manganese-bronze, the following mixture is taken:

Copper	50 parts
Zinc	40 parts
Alloy	10 parts

When calculated in percentages the preceding mixture works out as follows:—

Copper	52.55 %
Zinc	40.00 %
Nickel	3.53 %
Iron	2.26 %
Manganese	1.11 %
Aluminum	.55 %

It is claimed that a test-bar of this mixture will show a tensile strength of 85,000 lbs. per sq. inch. The essential difference between the mixture and the average manganese-bronze of commerce is in the content of nickel.

A Frequent Cause of Streaks on Nickel Plated Goods.

Upon nickel plated goods of some kinds, such as that herewith illustrated, streaks frequently make their appearance. When they occur, the surface of the metal in some portions is dark colored or black and upon first thought one would infer that the nickel deposit had been burnt by the use of too strong a current. That such is not the case may be readily noticed by the fact that the surface of the nickel deposit buffs to a good color and on the edges too where one would expect to find the worst case of burning. In the illustration is shown a brass disc which showed the streaks after the nickel had been deposited, although the photograph does not really indicate the true appearance.

Streaks on Nickel Plated Disc Caused by Buffing Dirt.

The cause of the streaks in instances of this kind is the presence of dirt from the buff wheels in the small holes. In the case of the disc shown and which was made of sheet brass with the holes punched through, the surface was cut down with tripoli and then colored with rouge. It was then cleaned and placed in the nickel tank. The streaks made their appearance after the deposit had arrived at considerable thickness. The cleaning of the disc was not thorough and the buffing dirt remained in the small holes. As the plating went on, the dirt gradually worked out and streaked the surface. It will be noticed that the streaks start from the holes and work upwards so it is readily appreciated that the dirt is the cause.

Buffing dirt in small holes of this nature is quite difficult to remove and requires particular attention. The momentary immersion in the potash kettle will not suffice to take it out. A longer immersion which will remove it completely will badly stain and attack the brass. It is necessary in these cases to clean the work in some of the various cleaning compounds that are made for the purpose and which will allow a long immersion without attacking the metal, and at the same time will remove the dirt. Hand scrubbing to remove the dirt usually is too costly, but if it remains in the holes after a long immersion in the cleaner, it will have to be done in order to remove it completely.

Silver Plating Brass Bon-Bon Tongs.

Large quantities of silver plated brass bon-bon tongs are annually made and are consumed by the large manufacturing confectioners who give them away with their products. At the present time, the manufacture of the tongs is confined to a few concerns. Some of the tongs are left with the surface produced by a bright dip, while others are matt dipped thus giving them the so-called "satin-finish".

As the tongs must be finished very cheaply, one would naturally think that a silver dip would be the best process for silvering them as a simple insertion is all that is necessary and a light coating of silver only can be put on. While some concerns use the dip for silvering the tongs, others prefer the regular process of plating with the current.

The objection to the silver dip is that, although it may work well when new, it is constantly deteriorating on account of the fact that a small amount of brass dissolves each time an immersion is made. It is difficult to keep the dip up to the required standard of whiteness on this account.

The objection to the electroplating method is the cost of labor, but the deposit is white and excellent and when all things are taken into consideration, it works out about as cheaply as the dip process. The great advantage lies in the fact that it works with

great uniformity from day to day. A solution containing as little free cyanide as possible should be used in order to obtain the necessary whiteness of the deposit, and also very little silver as all that is desired is the thinnest silver deposit that will give the necessary white color to the tongs. The tongs are, of course, first bright-dipped or matt-dipped previous to the dip or electro process of silvering.

Acetone.

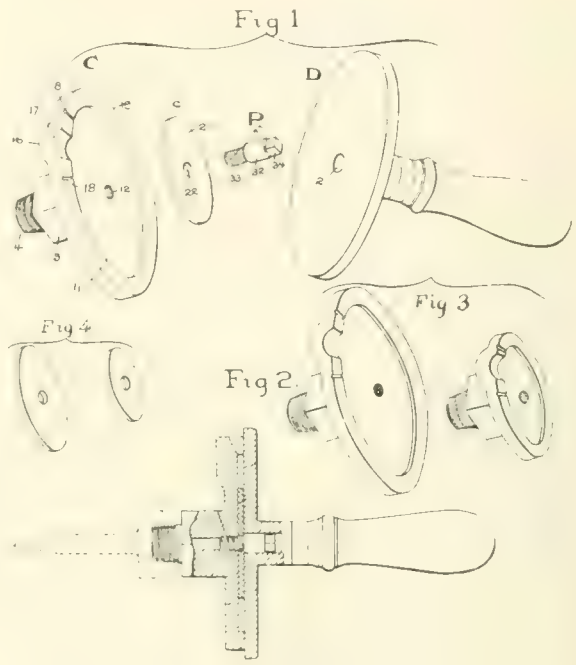
The manufacture of commercial acetone is based upon the direct decomposition of calcium acetate (acetate of lime) by heat. It breaks up into acetone, that is distilled over, and calcium carbonate. The calcium acetate is previously made from lime and crude acetic acid obtained in the distillation of wood. As this acid is always more or less impure, the calcium acetate is likewise impregnated with foreign substances which in turn contaminate the acetone. For this reason, commercial acetone is not pure. Among other things, it contains considerable wood alcohol (methyl alcohol).

Acetone is a clear liquid with a somewhat sweet odor, but when it contains other materials it is apt to have a rather pungent smell. It is lighter than water (pure acetone has a specific-gravity of 0.800) and mixes with it in all proportions. When pure the liquid mixture is clear, but oily impurities are often precipitated when the commercial article is mixed with water so that a milky appearance is given to the solution.

Acetone is an excellent solvent for various materials insoluble in water, such as celluloid, nitro-cellulose, gums, resins and waxes. It is used quite extensively in dissolving celluloid for applying to various articles. It is also used to some extent in the manufacture of lacquers on account of its solvent action on the nitro-cellulose (gun-cotton) or resinous base. Owing to the fact, however, that it mixes with water, its use is not advisable to any extent on account of the danger of the lacquer turning white when drying, particularly in damp weather. Other solvents, such as fusel-oil or amyl acetate, are preferable and extensively used because they do not mix with water. They are, therefore, water repellents, while acetone is a water absorbent.

Mold for Casting Soft Metal Flanges.

A mold for casting soft metal flanges, such as those made of lead and used in the manufacture of plumbers' brass goods, has recently been patented by Philip Mueller of the H. Mueller Mfg. Co., of Decatur, Ill., (U. S. Patent, 951,962, Mar. 15, 1910). The mold is herewith shown.



Mold for Casting Soft Metal Washers.

It consists of two discs of iron or bronze, C and D, one of which is furnished with a wood handle for holding it. The novelty lies in the use of washers of various sizes inside of the mold so that various sizes may be cast. Referring to the sketch, Fig. 1 is a perspective view of the four principal parts of the mold. Fig. 2 is a section when the mold is put together. Fig. 3 is a view of two different size matrices. Fig. 4 is a view of two cores of different size. When used, the mold is put together and held in the hand. The lead or other metal is then poured into it through the gate 17. Vents at each side of the gate allow the air to escape as the metal fills the mold.

According to determinations made by Berthelot in *Comptes Rendus* the boiling point of cadmium is much lower than that of zinc. The results of his determinations show that zinc boils at 920° C. (1688° F.) while cadmium boils at 778° C. (1433° F).

A Melting Furnace for Bulky Scrap Metals.

The melting of bulky scrap metals has always been a problem in brass foundries and a large amount of hand labor is frequently required. It has been demonstrated again and again, that in order to obtain the best quality of sand castings, scrap of a bulky nature should first be melted and run down into ingots which are then remelted and poured into the castings. When the castings are poured directly from the first melt, they are quite apt to be dirty and full of blowholes.

The Scrap Melting Furnace Made by the W. S. Rockwell Company.

To satisfy a demand for a furnace in which such material may be melted, the W. S. Rockwell Company, 50 Church St., New York City, have designed and constructed one herewith illustrated. Bulky copper wire, sheet brass scrap, brass wire old Fourdrinier cloth, turnings, chips, old condenser tubing, light brass scrap and, in fact, any material of this description may be melted in it with satisfactory results.

The furnace is designed for use with either oil or gas. The burner is at the side of the furnace. No chimney is required and a hood is placed over the furnace to carry off the waste gases and fumes. A large charging opening is provided so that the scrap may readily be inserted in it.

In using the furnace, it is heated for about half an hour before charging the metal. When it has arrived at the necessary temperature the scrap is charged and the charging is then continued as rapidly as it melts. When melted, an opening in the side is used for stirring the molten mass. The pouring is accomplished by tapping off the charge in the same method as followed in tapping a cupola. The slag and dross either may be skimmed off or allowed to run off at the last. After the metal has been tapped off, it is allowed to run into a bull-ladle from which it may be poured into ingots.

The furnace is made in sizes ranging from the smallest, holding half a ton to the largest size in which 15 tons may be melted in one charge.

Improved "Coslett" Process for Producing a Rust-Proof Finish on Iron.

The so-called process of "Coslettizing", which made its appearance in England some time ago, and which was fully described in THE BRASS WORLD, November 1908, page 373, consists in boiling the iron or steel article to be treated, in a solution composed of the following:

Water	1 gallon
Phosphoric Acid	4 oz.
Iron Filings	1 oz.

A black coating is thus produced on the iron or steel which protects it from atmospheric and other corrosive influences. The process seems to have withstood the test of time, and is now being used quite extensively in England for treating iron or steel articles which are to be preserved from rusting.

It has been found that the above formula for producing the coating, while giving good results in careful hands, is apt to be carelessly used and a certain amount of undissolved iron filings left on the surface of the article being treated. An irregular coating was thus produced. In order to overcome this difficulty, a concentrated solution is now being supplied (which apparently consists of phosphate of iron containing a small quantity of free phosphoric acid) so that operators may employ it instead of the aforesaid mixture and without danger of imperfect work. The process of using it remains the same. In addition, it has been found that when spots or other imperfections make their appearance after the oper-

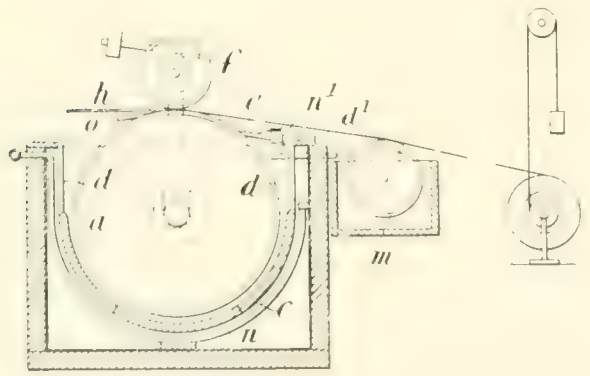
ation has been concluded, by rubbing a small quantity of the concentrated solution on them, such flaws can be repaired. As far as the protection of the coating against corrosion is concerned, it is stated that a piece of steel treated by the process and immersed in salt water for nearly a year, has resisted its attacks so that it is practically free from corrosion, while a similar piece untreated has become badly rusted.

The strength of the solution is important, and the proprietors of the process recommend the use of a standard solution of sodium hydroxide for testing it with the employment of phenol-phthalein as an indicator. This process, however, is a well known method of analytical chemistry and needs no further description. When used, the solution strength may always be maintained in a uniform condition and a uniform coating is then constantly produced.

The Production of Metal Coated Paper.

A process for coating paper or cloth with copper has been brought out by Sherard O Cowper-Coles of London, the well-known English inventor. The process is quite simple and is carried out as follows:—

A large drum of aluminum is placed in a solution of sulphate of copper used for depositing copper in the regular manner. The drum may be plain on the surface or have any figured design that may be desired. This drum is then slowly rotated and used for the cathode



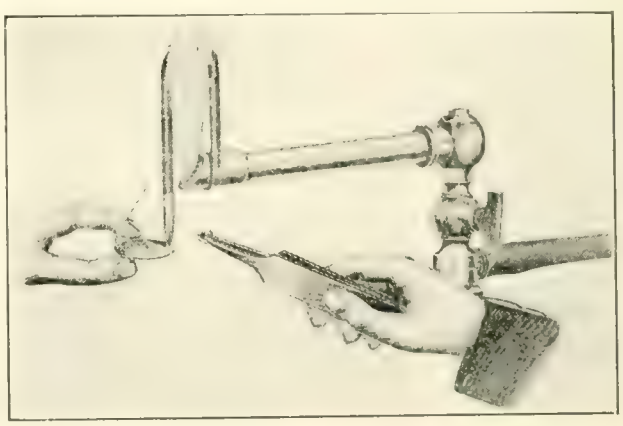
Cowper-Coles Process for Copper Plating Paper.

and a thin coating of copper deposited upon it. At the same time a sheet of paper or cloth is fed along to the top of the drum under a second and smaller roller which presses it tightly down upon the aluminum drum. Before the paper is fed to the drum, however, one side of it is automatically coated with glue or other adhesive so that when it is pressed down upon the copper deposited upon the aluminum surface of the drum, the two adhere and the copper is lifted off. In this manner the copper is securely fastened to the paper or cloth.

The product thus obtained is a copper coated paper or cloth which may be obtained in various figured designs and employed for decorative purposes. The object of using the aluminum drum is so that the copper will not adhere to it, but Cowper-Coles states that a lead drum also gives good results as the copper may be stripped from it readily.

An English Soldering Device.

A novel device for soldering recently has made its appearance in England. It is supposed to take the place of a soldering iron, but is so constructed that both hands are left free to hold the work to be soldered. As constructed, the device consists of a goose-neck piece of copper which fits upon a gas bracket. The loop of the goose-neck is heated by a burner that fits over the end of the bracket. In this manner the whole is heated.

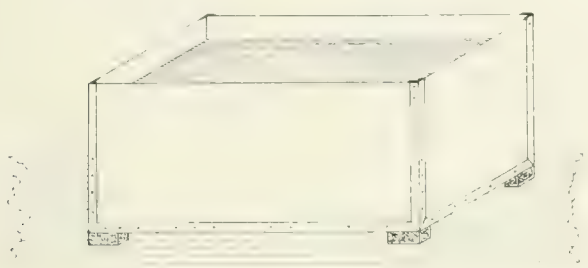


English Soldering Device.

To use the device the gas is lighted and the goose-neck allowed to heat. The tip is tinned previous to applying in the same manner as that followed in using a soldering iron. The tip is then held to the portion of the work to be ,soldered, and as both hands are free clamping is avoided. The device is, of course, useful only for soft soldering.

The Insulation of Steel Plating Tanks.

As steel plating tanks have come into extensive use and are the most serviceable for cyanide plating solutions, particularly those which are used hot, such as a cyanide copper solution, instruction about their insulation will not come amiss. Unless care is taken thoroughly to insulate them, grounding will take place with the accompanying waste of current and unreliability of meter readings.



Manner of Placing the Tanks on Paraffined Bricks.

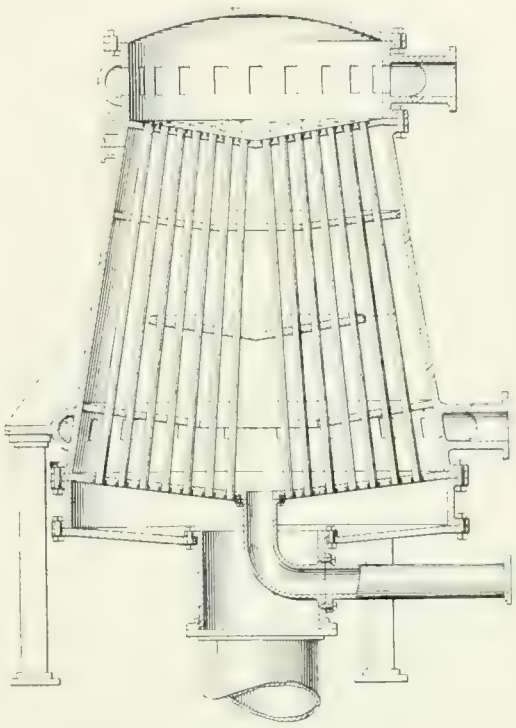
Plating room floors soon become saturated with plating solutions and thus are fairly good conductors of the current. This is especially so when the floor is constantly wet as it usually is, and to insulate the tank completely, it is necessary to interpose some non-conducting material. For such a purpose there is nothing superior to paraffined bricks. Paraffine is one of the best water repellents known and the brick, on account of its porosity, is easily saturated with it. The paraffined brick, therefore, acts, as far as the insulation is concerned, as though it were a solid mass of paraffine.

The brick employed for the purpose may be of any kind. Before treating with the paraffine it should be dried in order to remove all moisture. This may be done in an oven, on top of a furnace or in any other desired manner. When dry, immerse it in a kettle of melted paraffine until no more air bubbles are given off. Then take out and cool when it will be ready for use. The bricks are used under the tank as shown in the sketch.

According to a recent *Consular Report,* a trust is being formed in Germany to control the manufacture of precipitated chalk. This substance is used for tooth powders and as a silver polish for household use.

A Method of Prolonging the Life of Brass Condenser Tubes.

A method of prolonging the life of brass condenser tubes has been invented by Frederick J. Loomis of the Standard Brass & Copper Tube Company of New London, Conn., who has had many years of experience in the manufacture of brass tubing and also in the marine end of the problem. Instead of attempting to make a brass tube that will stand the severe conditions of a marine condenser, Mr. Loomis has "taken the bull by the horns" and constructed one that will prolong the life of the tube.



Condenser for Prolonging the Life of Brass Condenser Tubing.

The novelty of the process is in the manner in which the condenser has been constructed. In the ordinary condenser, the tubes are placed horizontally so that sediment lodges on the bottom and bubbles of gas adhere to the top. Corrosion then sets in with the usual results. The incrustation produced by the sediment causes pitting or de-zincification. In the condenser constructed by Mr. Loomis, the tubing is placed vertically so there is no opportunity for the sediment to lodge, or the gases to adhere to the surface. This is brought about by the fact that the gravity of the particles causes them to descend, and the greater velocity of the cooling liquid also tends to wash them away. In addition to this.

feature, the condensed water is not cooled down to the temperature of the water used for producing the condensation, but is left warm so that economy is obtained in its use for boiler feeding.

A New Form of Apparatus for Agitating Plating Solutions.

While theoretically an agitated plating solution is the ideal condition for the production of a heavy deposit free from pitting and in the most rapid manner, many of the forms of apparatus used or proposed have been open to

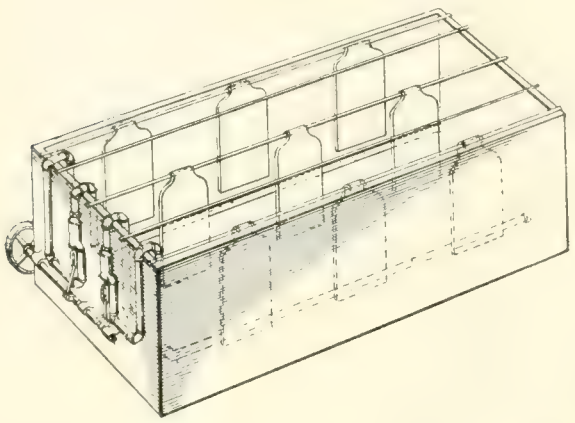


Fig. 1. Method of Placing the Pump Outside of the Tank.

some objections. A new form of apparatus for such agitation has been invented and patented by George L. Wallace of Bridgeport, Conn., (U. S. Patent 950,973, March 1, 1910) and is herewith illustrated.

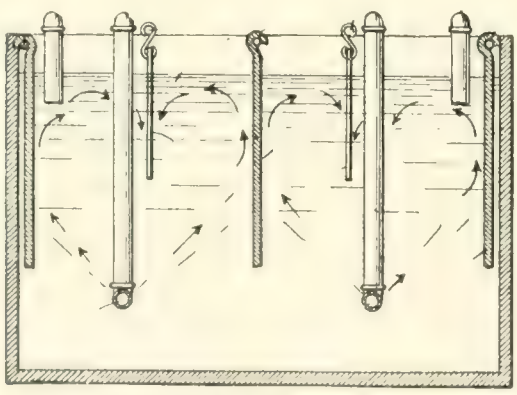


Fig. 2 Cross-Section of Tank Showing Distribution of Pipes.

The principle of the apparatus lies in the use of a pump outside of the plating tank, as shown in Fig. 1, and by means of which the solution is taken from the top of the tank and injected at the bottom in a continuous manner. In Figs. 2 and 3 are shown the method of distributing the pipes in the bottom of the tank so that an even delivery is obtained.

The advantage of the process lies in the fact that the pump acts simply to circulate the solution and does not aerate it like the method of pumping it and allowing it to flow into the top through a pipe, the end of which is situated above the surface of the liquid. As the

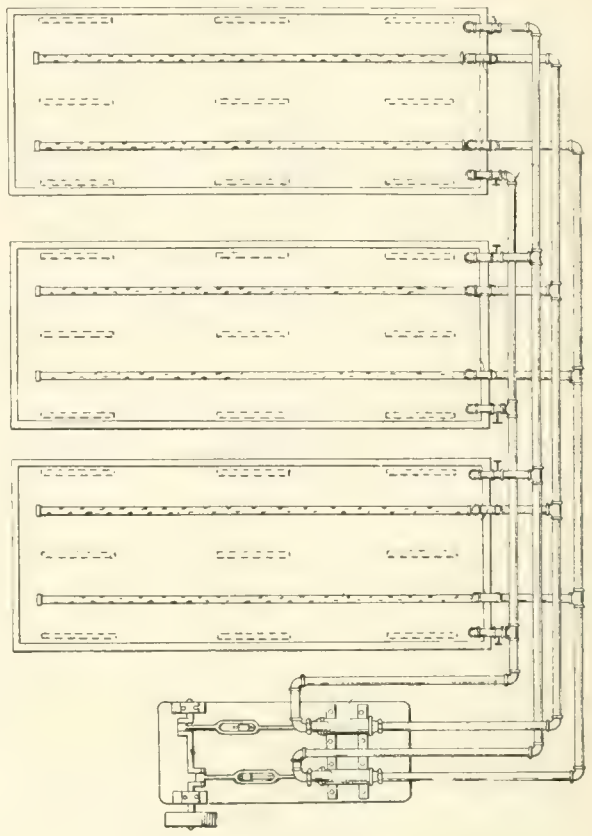


Fig. 3. Plan of Tank With Pipes for Carrying the Solution.

flow of the solution from the pipes in the bottom is upward, the work that is being plated is not disturbed and practically all of the advantages of a still and agitated solution are obtained.

For nickel solutions the pump is made of some material like hard lead so that it is not acted upon, and the pipes are also composed of lead. For acid copper solutions the same materials are employed, while for cyanide solutions iron answers satisfactorily.

It has been found that metallic cadmium is superior to zinc as a protective coating for iron or steel. It gives the same protection as zinc, as far as the galvanic properties are concerned, but the coating is harder and remains bright longer. Its cost is such, however, that it cannot become a competitor of zinc for this purpose.

The "Fire-Copper" Finish.

By George Thompson.

For the benefit of those who may be called upon to do some of this class of work, the writer will endeavor to explain the method of producing the so-called "fire-copper" finish. It is a finish we hear very little about on account of the fact that lacquer, when applied to it, robs the colors of some of their beauty.

Any article that will stand the heat of molten solder may be finished in this manner. Brass or metals other than copper itself are first given a heavy coat of copper in the acid copper solution. Solid copper articles need no treatment. The surface does not require buffing.

Clean the article and then hold it, face up over a clear red fire or over an ordinary gas burner. It should be held about three inches from it and must not come in contact with the flame. When the article has become about as hot as an ordinary soldering iron, remove it from the fire and allow it to cool in the air. After a little practice the operator will be able to judge the correct time to withdraw the article from the fire. The surface will have a fire-red color that is well adapted for certain classes of work.

The Blevney Tube Polishing Machines.

One of the new products of the factory of John C. Blevney, 216 High St., Newark, N. J., is a machine for polishing brass or other metal tubing. This machine was first designed for polishing brass bedstead tubing, but it has been found equally well adapted for other kinds of tubing or small metal goods which can be fed automatically. The machine is herewith illustrated.

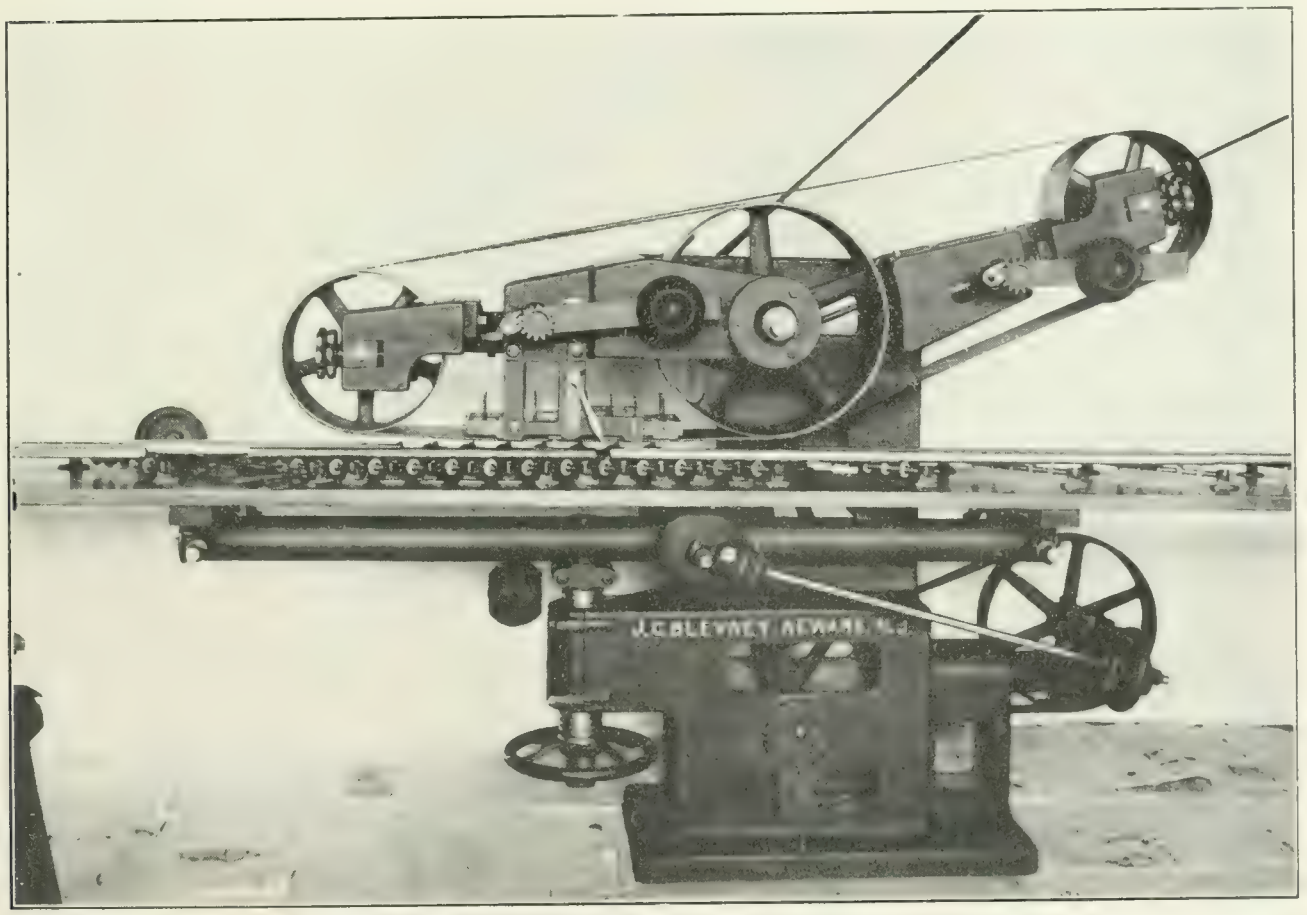


Fig. 1. The Blevney Machine for the Automatic Polishing of Tubing.

In Fig. 1 is shown the machine polishing 7/8 in. round brass tubing. In Fig. 2 is a view with the platen and the parts of the machine removed. The tubes are fed from left to right on rubber covered roller shafts and the polishing is accomplished by passing under the abrasive belt. This belt is made endless and any desired abrasive is used on its sur-

face. Inside of this belt is a second or cushion belt which is one of the features of the Blevney machines. The two belts do not run at the same speed, but there is a slight difference which renders it impossible for the abrasive belt to buckle or wrinkle during the polishing.

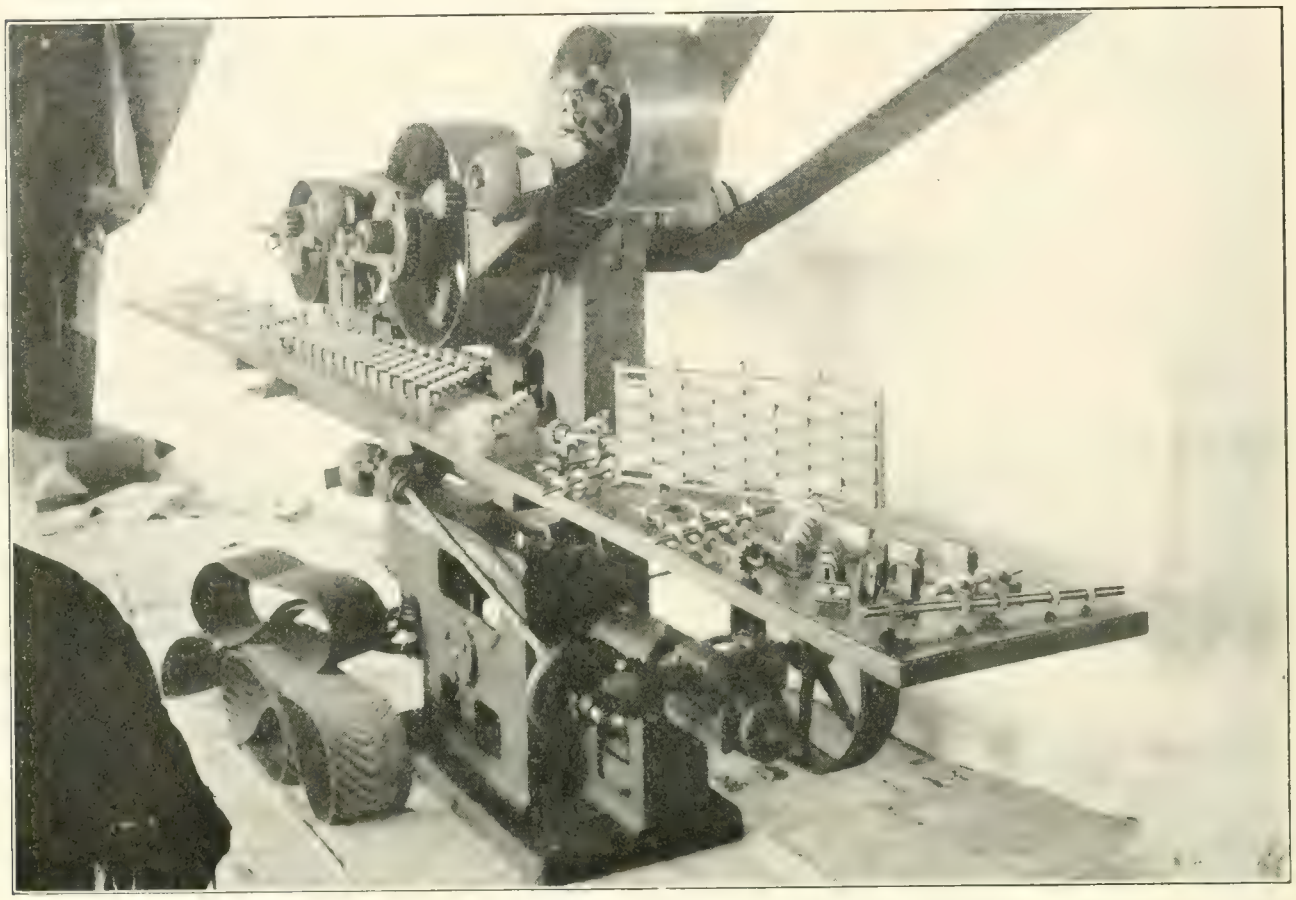


Fig. 2. The Blevney Machine Showing Parts.

The machine is operated by placing the tube on the feed rollers and then raising the table by means of the hand wheel and adjusting screws. The platen is dropped by a small lever and the tube is then carried through by friction. The table is automatically shifted to prevent the belt from being worn in one place. The tension of the belt is produced by weighted counterlevers. Various kinds of finishes may be produced upon the machine, from a velvet finish up to one of a high color. In case the tube is to be colored, the abrasive belt is replaced by one of felt upon which rouge is applied.

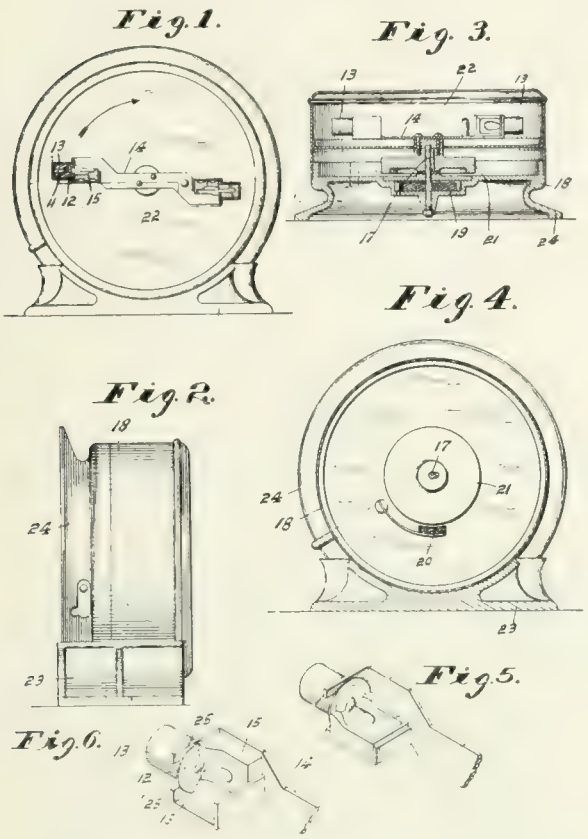
Yellow brass makes a poor bearing metal and for a good bronze bearing, no zinc should be present in the mixture.

Making Castings by Centrifugal Pressure.

A process of making small castings by centrifugal pressure has been creating considerable interest in the trade, particularly among dentists, and some very creditable work has been done. It has not been used upon large castings, but there is apparently no reason why the method cannot be applied to the making of medium size castings as well as the small ones. The process is the invention of Alexander Jameson of Indianapolis, Ind., and while the apparatus has been upon the market for some time, it has only recently been patented (U. S. Patent, 950,106, Feb. 22, 1910).

The principle of the process is simple. The metal to be cast, such as, for example, gold or silver, is placed in a small cavity or crucible 15 where it is melted by a blowpipe. Immediately adjoining this crucible is the mold. The mold and crucible are arranged in pairs as shown, in order to balance one another. They are arranged on two arms, 14 or a round disc, as may be desired, so that they may readily be rotated. The whole device is enclosed in a sheet metal casing for protection

against an accident. In the bottom is a strong, coiled steel spring which is released when necessary by a trigger or similar device. In operating, the appliance is used in the following manner:



Centrifugal Casting Machine.

The metal is melted in the small crucible adjacent to the mold, and when at the proper heat, the spring is released so that the arms carrying the molds immediately revolve in a rapid manner. The metal is then forced into the mold by the centrifugal action and not only is a sound casting produced, but the details of the mold are faithfully reproduced in the casting.

An alloy of 80% copper and 20% tungsten has been proposed as a material for making projectiles on account of its high specific-gravity (tungsten has a specific gravity nearly equal to that of gold), and it is claimed that if a small quantity of aluminum or magnesium be added to the molten mixture of the two metals, the tungsten will produce a homogeneous alloy and will not separate out on cooling.

Correspondence.

Barium Cyanide for Regenerating Silver Plating Solutions

Editor:

Referring to the article in THE BRASS WORLD, March, 1910, page 87, by B. Wenzelmann on the management of silver plating solutions and their regeneration by the use of barium cyanide, would refer to the following article in the "Kalender for Electrochemiker," by Dr. A. Neuberger, which indicates that barium cyanide has been in use in Germany for such a purpose:

"According to the percentage of potassium carbonate in the silver solution, which should first be determined by chemical analysis, a certain quantity of barium cyanide is added, as it can be taken from the following table. By this process, barium carbonate is precipitated and the potassium carbonate regenerated to potassium cyanide. Besides this, the silver that has been used up, must also be replaced by an addition of silver cyanide:—

A	B	C
1.	6.7	0.95
2.	13.4	1.90
3.	20.1	2.85
4.	26.8	3.80
5.	33.5	4.70
6.	40.2	5.70
7.	46.9	6.65
8.	53.6	7.60
9.	60.3	8.55
10.	67.0	9.50
11.	73.7	10.40
12.	80.4	11.40
13.	87.1	12.35
14.	93.0	13.30
15.	100.5	14.20
16.	107.2	15.20
17.	113.0	16.15
18.	120.6	17.10
19.	127.3	18.00
20.	134.0	19.00

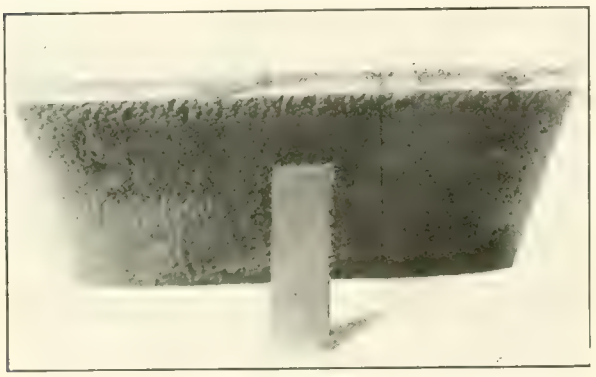
R. H. C.

A. Grams of Potassium Carbonate in Liter.
B. Amount of 20.5% solution of Barium Cyanide to be added in c. c.
C. Renegerated Potassium Cyanide in grams.

A benzine dip is always economical for removing machine oil from machined castings previous to electroplating and allows a saving to be made of the potash or lye.

An Electrolytic Copper Anode as an Example of Spotting-Out.

A subscriber sends us an electrolytic copper anode, (herewith shown), which he believes is a good example of the phenomenon of "spotting-out". The anode has a green coating on the edges as shown and where it has been cut off by shears. This coating made its appearance about a year ago and was wiped off, but after a time more began to show. Later, the exuding stopped and the anode was then placed on the top of a steam radiator when the spotting again took place and continued for a long time.



Electrolytic Copper Anode which "Spotted-Out" on the Cut Edge.

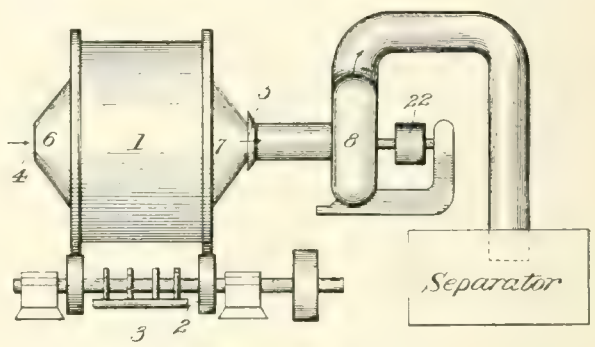
The cause of the spotting-out, of course, is identical with that found in electroplated work. In the case of the copper anode, however, it is much greater. When the copper is deposited for making electrolytic copper cathodes (which used in the electroplating industry are called anodes) it frequently forms in layers which imprison the sulphate of copper solution. In this particular instance a large quantity of the solution was held so that the spotting-out took place for a long time. In the case of the spotting-out of electroplated work, minute cavities hold back the solution which gradually works out.

W. C. Heraeus, the platinum manufacturer of Hanau, Germany, prepared some very pure platinum containing less than 0.01 percent of impurities, but found it too soft for the majority of purposes. He advised, therefore, the use of a small quantity of iridium as a hardening metal for it. From 1 to 2 percent was recommended for ordinary uses. Such an alloy has great durability.

Removing Tin from Tin Plate Scrap by Mechanical Means.

A novel process for detinning tin plate scrap by mechanical means has been patented by Charles J. Reed of Philadelphia, Pa., (U. S. Patent 950,115, Feb. 22, 1910). The manner in which it is accomplished is as follows:

The tin plate scrap from which the tin is to be removed is placed in an iron tumbling barrel and heated by gas or oil burners underneath to a temperature sufficiently high to melt the tin. This is readily carried out on account of its low melting point. Finely divided magnetic iron ore is then added in about the proportion of equal parts of scrap and iron ore. The barrel is then tumbled and the ore abrades the surface of the tin plate scrap and rubs off the molten tin. When removed it is in a finely



Detinning Apparatus.

divided condition and is taken off by an exhaust fan 8 and carried to the separator. Some of the iron ore is also carried over and may be afterwards removed from the finely divided tin by sifting.

The principle of the process lies in the fact that, at its melting point, tin is physically weak and is easily removed from the tinned iron surface by abrasion. The object of using the iron ore is that it is heavy and hard and the tin will not adhere to it. When broken it presents a sharp surface well adapted for the purpose.

Sal-ammoniac, although frequently recommended as a flux for high melting metals, has no effect on them as it immediately volatilizes when thrown on the surface. It has been recommended for gold, but it has no effect on it.

The New Plant of the Whiting Mfg. Co.

The new plant of the Whiting Mfg. Co., at Bridgeport, Conn., has been completed and is now being occupied. Manufacturing has already been started and it is expected that within a short time the factory will be run to its full capacity.

The New Plant of the Whiting Mfg. Co. at Bridgeport, Conn., Manufacturers of Sterling Silver Wares.

The Whiting Mfg. Co., is one of the largest and oldest manufacturers of sterling-silver wares in the United States. Both flat-ware and hollow-ware are manufactured and the company has always been noted for the high quality of its product and the beauty of its designs. For many years they were located in New York City at 4th. St., and Lafayette Place, but the growth of the sterling-silver industry has been such within the past decade that their business required more extensive quarters and it was decided to locate in Bridgeport, Conn. A new brick factory of ample size to take care of their future growth has been built on Bishop Ave., and the N. Y. N. H. & H. R. R., and is herewith shown in the accompanying photograph.

The Scientific Treatment of Acid Burns.

According to the *Chemical Trade Journal* the following method of treating nitric or sulphuric acid burns is followed at the works of the Nobel's Explosive Company, Ltd.:

Acid burns are sometimes very deceptive as to their severity, especially those from nitric acid. This acid causes a yellowish stain on the skin, which has a peculiar parchment-like feeling to the touch. The burn is apt to be made light of at first; but in a few days a red line, denoting inflammation, begins to form round the yellowish patch, following which separation of the slough commences, which takes a considerable time and leaves a raw, granulating surface, slow in healing. If not carefully attended to, so as to keep the granulation down, it will leave a prominent scar and permanent disfigurement.

Treatment.—In all cases of severe burns, either from nitric or sulphuric acids, the patient should at once be plunged into the usual tank containing water and bicarbonate of soda; then the part should be thoroughly

bathed in pure, warm water, afterwards applying a cloth saturated with oil, and then covering with cotton wool and a bandage The patient should at once be taken to his home or a hospital. Then commences the proper treatment of the burn, which is suitable for both nitric and sulphuric acid burns.

A piece of surgeons' lint saturated with carron-oil (equal parts of linseed oil and lime-water) is applied, the smooth surface of the lint being placed to the part, and is covered with oiled silk or gutta tissue, cotton wool or gamgee and absorbent bandage. This dressing should be changed night and morning for the first few days, but should the burn be very severe and painful, then a thin piece of cotton cloth saturated with carron-oil, and a warm bread and water poultice are applied covered as before with wool or gamgee and a bandage.

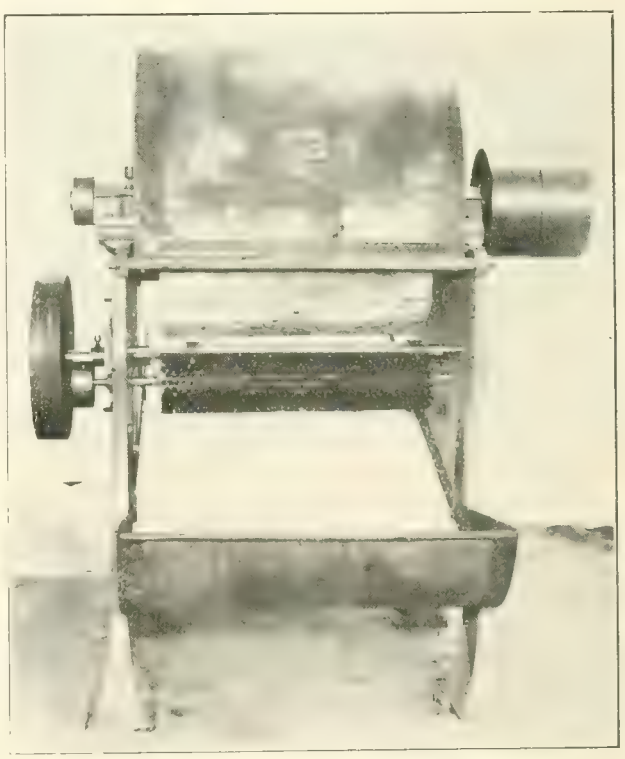
The poultices should be renewed at least two or three times in 24 hours and continued until the separation of the slough, when the carron-oil and G. P. tissue dressings are reverted to, as at first. Should the burn become irritable and slow in healing, then carbolic oil, boric lint, or the following paste may be tried, according as is found suitable. The paste is composed of equal parts by weight, of carron-oil and zinc oxide ointment. Should the granulations become exuberant or above the level of the surrounding skin, they should be painted over with a 2 per cent solution of cocaine, before being touched; every second day, with a solution of nitrate of silver (15 to 20 grains to the ounce of distilled water), or with solid lunar-caustic, afterwards being dressed with carbolic or carron-oil, as before.

Acid Burns of Eyes.—Acid burns of the eyes should on no account be bathed with alkaline solutions, but at once and liberally, with pure, warm water, or warm water and milk, allowing the fluid to run freely over the eyeballs. Afterwards a few drops of a two per cent solution of cocaine hydrochloride, slightly warmed, are then applied, then a little pure castor oil, and lastly, a piece of lint saturated with warm water is placed over the eye and held there by means of a light bandage. This can be repeated two or three times a day.

Cocaine alkaloid dissolved in castor oil is sometimes used, but the first method is the better. A 2 per cent ointment of cocaine hydrochloride and vaseline applied to the eyelids, affords great relief and should be applied at bedtime. In using the cocaine solution, a good plan is to warm a teaspoon in hot water, thus making the application more agreeable to the injured eye. The treatment should be continued for a few days, but the after treatment must depend entirely upon the severity of the burn.

A Polishing Machine for Sheet Metal.

A useful machine for scouring or polishing sheet metals of all kinds has been placed on the market by Francis A. Weisbecker & Sons, 22 Frost St., Brooklyn, N. Y., and which is herewith illustrated. The machine is intended for the polishing of sheet metal in short or continuous lengths and is built in sizes ranging from 16 to 42 inches in width.



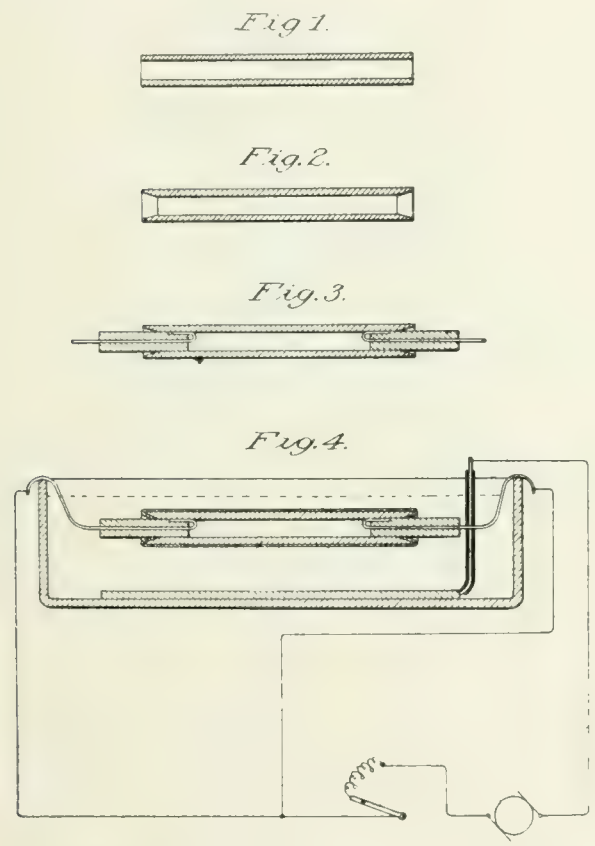
The Weisbecker Sheet Polishing Machine.

The machine will scour or polish saw steel, soft steel, copper, silver, brass, bronze, zinc, aluminum, German-silver or any other metal in sheet form. The sheet is simply fed into the machine and the polishing rolls, driven by a belt, act upon its surface and produce the desired finish. Any desired polishing composition may be used to suit the metal that is being polished.

Copper Plating Steel Tubes.

A method of copper plating steel or iron tubes has recently been invented and patented by Wm. H. Winslow of Chicago, Ill. (U. S. Patent 950,777, Mar. 1, 1910). The process is as follows:

The steel or iron tube to be plated, as shown in Fig. 1, has two plugs of wood or other non-conducting material driven into the ends. Before doing this however, the ends of the tube are slightly countersunk so that it appears like Fig. 2. The plugs of wood are bored and



Method of Copper Plating the Steel Tubing.

copper wire inserted for the conductors. The wires are pushed through the plugs and then turned upwards so that the top of the tubing is touched, thus forming the connection. When so arranged, the tube has the appearance shown in Fig. 4. The outside of the tube is then sand-blasted to clean it, after which it is immediately immersed in a weak solution of copper sulphate so that a thin film of copper is deposited upon the surface. It is claimed that this operation is quite essential as it protects the tube from any possibility of rusting.

The tube is then given a deposit in a cyanide copper solution, and then in an acid copper solution to produce the necessary thickness. It is then rinsed and dried after which it is scratch-brushed and tinned by immersion in a bath of molten tin. The tinning is done in order to fill any pin holes that may have formed. The tube thus made, the inventor states, is strong and non-corrosive and suitable for automobile work as well as for boiler tubes.

Electrogalvanizing Iron Pipes.

A method of electrogalvanizing iron pipes has been patented by Lynn A. Williams of Evanston, Ill. (U. S. Patent, 951,265, Mar. 8, 1910) in which both the interior and exterior

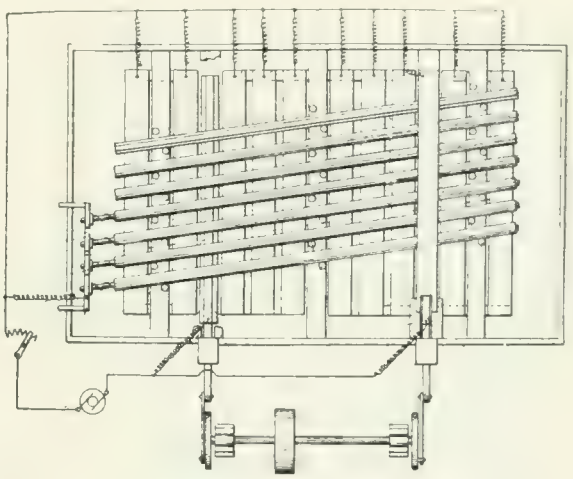


Fig. 1. Showing How Pipes Are Arranged.

are plated at the same time and in an expeditious manner. The pipes to be plated are cleaned by sand-blasting or pickling and then placed in the apparatus herewith shown.

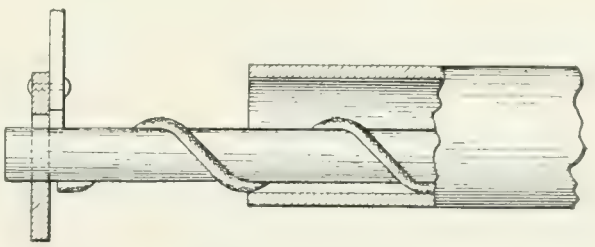


Fig. 2. Method of Inserting the Anode.

The pipes are placed on supports forming the base and provided with pins to prevent the shifting during the subsequent movement. The tubes are placed in the tank diagonally as indicated. The rack upon which they rest is moved back and forth by power mechanism outside of the tank. The connection between the pipes and current is formed, as shown in Fig. 1, by supports upon which no pins are

placed. The lateral motion, therefore, that is given to the rack support serves to turn the pipes over or rotate them and thus prevent any contact spots which are not plated. The manner of inserting the anode inside of the pipe is shown in Fig. 2.

Some New Forms of Apparatus for Treating Small Metal Goods.

Some new forms of apparatus for treating small metal goods have recently been placed on the market by Smith & Richardson of Attleboro, Mass. In Fig. 1 is shown a new form of barrel for dry tumbling or tubbing with leather or sawdust. It is arranged so that the work may readily be removed and it

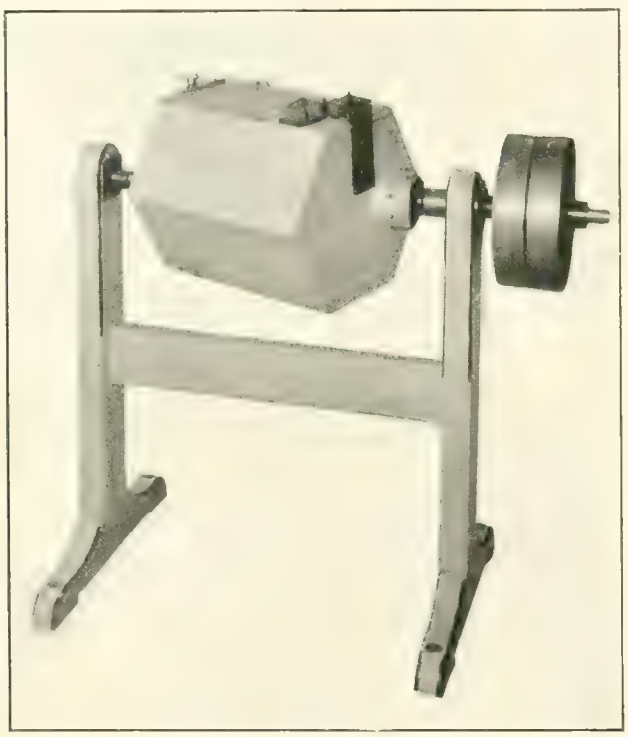


Fig. 1. The Machine Used for Dry Tumbling.

is particularly well suited for the maker of gold, silver, brass and steel metal goods who desires to polish or clean them.

In Fig. 2 is shown the new cutting down or scratch-brushing machine which is also adapted for all kinds of small metal goods. It is to take the place of hand labor. The work comes out evenly finished. In Fig. 3 the interior portion of the machine is shown and it should be noted that it is supplied with two handles on each end for lifting it from the tank. The feature renders it very easy to remove it for filling or emptying.

Is It Superfluous to Lacquer Nickel Plated Goods?

One would scarcely expect that gold or platinum goods would be lacquered, as these metals are non-corrosive and do not tarnish upon exposure to the air. The object of lacquering metal goods, of course, is to prevent their tarnishing under the influence of the atmosphere or similar agencies. Non-tarnishable metals, like platinum and gold certainly do not require lacquering.

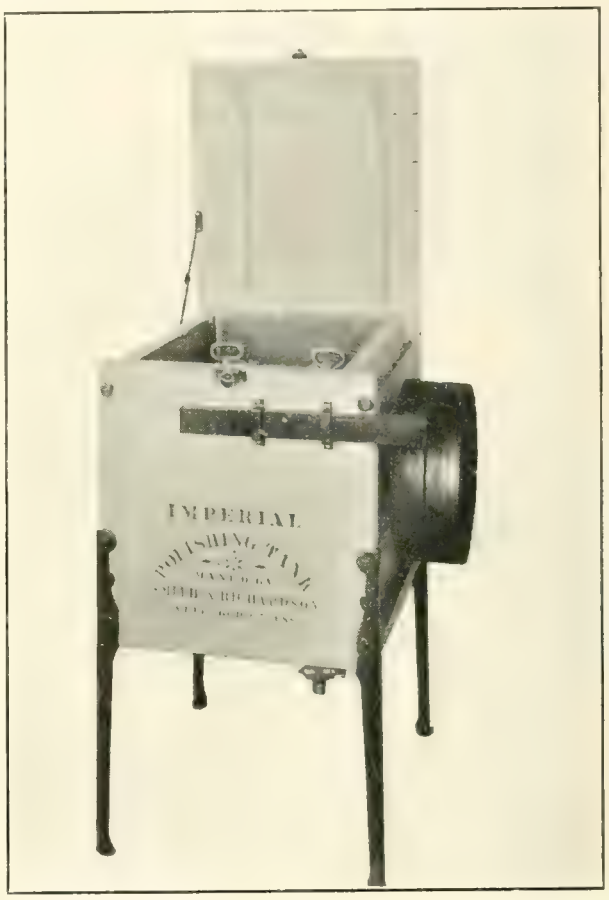


Fig. 2. Machine for Scratch Brushing or Cutting Down.

Nickel is one of the most non-corrosive of the common metals, and while it remains bright for a certain length of time, sooner or later, depending upon the nature of the atmosphere or handling to which it is subjected, it will tarnish. The tarnish is not a corrosion in the sense that copper or brass corrodes, but a mere superficial film which dulls the lustre and color of the nickel. It is particularly apt to happen when the deposit contains iron, as it frequently does when an old nickel solution that has become contaminated with considerable iron from the anodes is used.

The lacquering of all nickel plated goods would neither be advisable nor necessary and

it would add to the cost and not give results of a value to warrant it; but there are instances, however, in which it is desired to protect the nickel against the attacks of atmosphere, corrosive gases, or handling, and in these cases a thin coat of lacquer is an excellent thing. When lacquering nickel plated goods it is necessary to remove the buffing composition thoroughly or the lacquer will

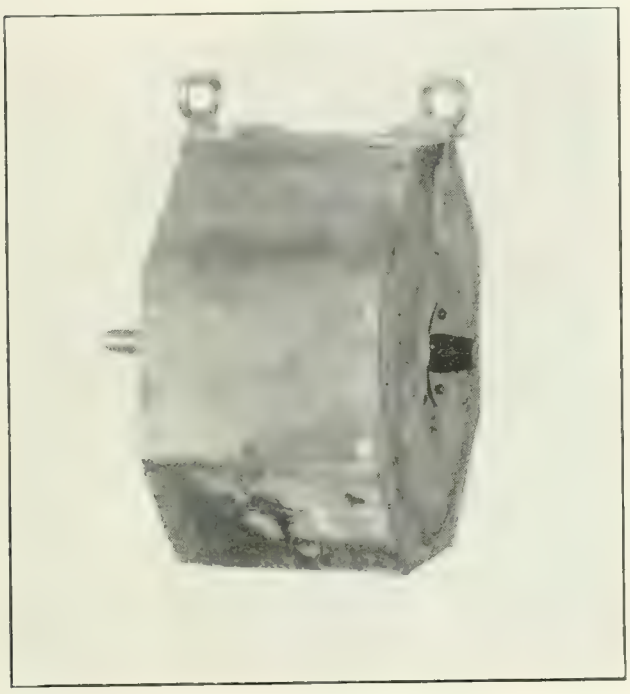


Fig. 3. Interior Portion of Fig. 2.

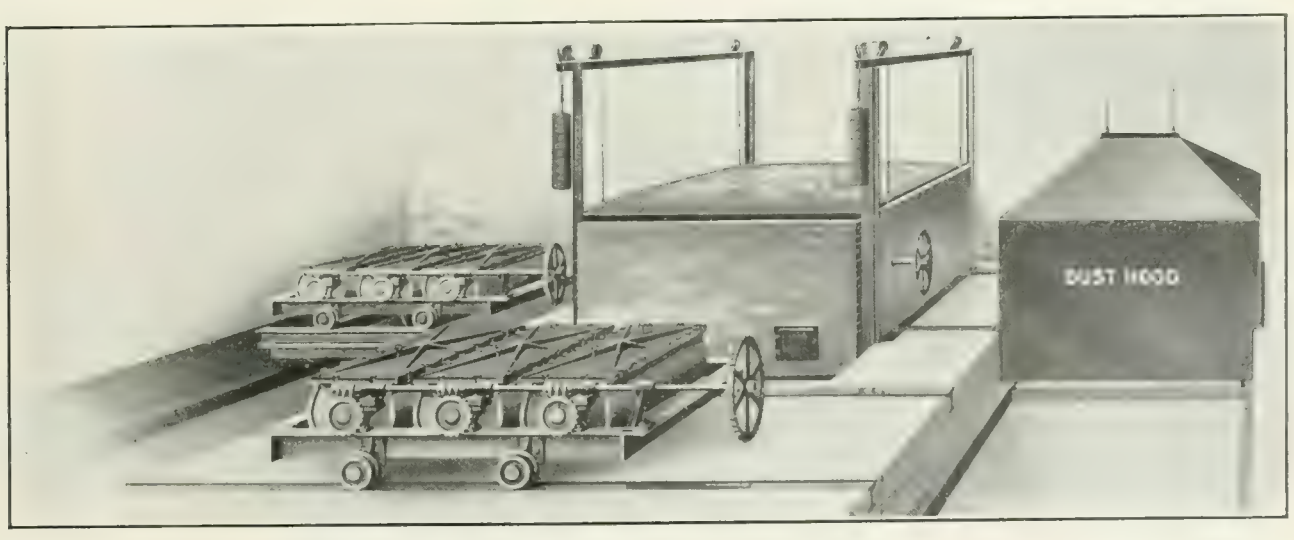
peel. Vienna-lime and similar white buffing compositions are now so extensively employed, and are more difficult to clean than rouge, that particular care is needed in their removal. When this is done, however, the lacquer will usually hold well and protect the nickel deposit against future tarnishing. When to use lacquer on nickel plated work will have to remain with the maker of the goods.

A Complete Sherardizing Equipment.

As the proprietor of the first commercial Sherardizing plant in the United States, the Globe Machine & Stamping Company of Cleveland, Ohio, recognized that the success of the operation depends upon its continuous working. Bearing this in mind they have given the matter much time and thought and with the result that special forms of apparatus have been constructed so that the time of the heat has been reduced to six hours, and at the same time, the quality of the work has been improved. By its use they have been able to run four heats per day without adding to the necessary force of two men.

The equipment that they have designed consists of 1 oven, 4 Sherardizing machine and 2 transfer cars with the necessary tracks forming a rectangle, and having a short spur of track which is not shown in the cuts, but which extends at a right angle to the pit at the right. The Sherardizing machines consists of three drums, mounted as whole upon a car. Each drum is turned over, when necessary, by a worm gear. All the time the drums are in the oven, they are turning over and over in order to bring fresh zinc dust to the surface of the articles that are being treated. It also serves to heat the contents of the drum in a much less time than when the Sherardizing is conducted stationary.

The Sherardizing machines hold about four kegs of small articles such as bolts, washers, screws, etc., and three kegs of zinc dust. The ovens are heated by oil or gas.



General View of the Sherardizing Plant.

Questions and Answers.

QUESTION No. 780. In producing oxidized silver goods is it necessary to lacquer them after oxidizing? We refer more particularly to coffin hardware which we are making.

Answer. You should lacquer your goods that have been oxidized. If you do not do so they will become iridescent and dirty after a time which gives them a bad appearance. Special lacquers are made for the oxidized finishes that give the goods a better appearance than ordinary lacquers.

QUESTION No. 781. If manganese-bronze castings come with spots of dross on the surface does it indicate that the mixture is at fault or the molding? The castings I have to make of the metal are not large and yet I do not seem to produce clean ones. They also have a kind of gray appearance and are not bright yellow like good manganese-bronze so I had an idea that the mixture might be at fault. I have not made the bronze myself, but purchased it from one of the large makers so I cannot understand why it should be of the wrong mixture.

Answer. The mixture has nothing to do with the presence of the dross in your castings. It is caused by either the manner in which the castings have been gated or the heat at which they have been poured. From the fact that your castings have a gray appearance, we should say that you are pouring the metal too hot. Give the pattern as long a gate as possible and pour at a low heat and we believe you will have no further difficulty.

QUESTION No. 782. I have a 400 gallon bronze solution which is composed of copper, zinc and a little tin. When there is an intense current it plates red, and when the current is reduced it plates yellow. Just the opposite from what it should. What is the cause?

Answer. With the strong current you are obtaining what is known as "zinc-red", and as by reducing the current you deposit a yellow brass it shows that you have too much zinc in the solution. Add more copper to your solution and you probably will have no more difficulty. Bronze solutions are preferably run warm.

QUESTION No. 783. We have been making some bronze placques that are cast in sand and then finished and mounted on an oak background. Our moulder, although an experienced man, does not seem to produce the necessary quality of castings for the work. He believes that the difficulty is in the mixture. What we have had him use is the following: Copper 90%, tin 7%, zinc 1½% and lead 1½%. The castings come out rough although he states that he has faced the mold with plumbago? Is the mixture at fault?

Answer. The mixture you are using is as good as any for the purpose if new and pure metals are employed in it. Your molder is apparently lacking in a complete knowledge of making this kind of work. Plumbago is not used to face the mold. Your sand, too, is apparently too coarse. Use a fine Windsor-Locks sand for facing the mold and then skin-dry it. If the face of the mold is then smoked by a benzine torch or other smoky flame, the surface of the castings will be improved although a smooth surface can be obtained without it. For the best work, however, the face of the mold is usually smoked.

QUESTION No. 784. What is the best resist for use in etching gold?

Answer. You will find asphalt the best for the purpose. You can use ordinary asphalt paint of good quality, or dissolve ordinary lump asphalt in benzol (not benzine). It is painted on.

QUESTION No. 785. In producing the verde-antique finish by the electrodeposition method by means of the solution of potassium bichromate and copper sulphate, I find that the deposit does not adhere but brushes off. As soon as it is covered to the desired depth, I remove, rinse and then brush as directed. I have tried it on all metals and it does not stick to one of them.

Answear. You apparently have not read the directions carefully and are brushing off the deposit when wet. Allow to dry in the air and brush when thoroughly dry and it will adhere strongly. When wet it easily brushes off.

QUESTION No. 786. Can metallic vanadium be melted in an ordinary brass melting furnace so as to make a bronze? I desire to experiment on the subject.

Answer. Vanadium is one of the most infusible metals and is, perhaps, exceeded only by titanium although the actual melting point has not been determined. It is supposed to be in the neighborhood of 3600 degrees F. much higher than even that of platinum. You will not be able to melt it in your furnace. You can purchase an alloy of copper and vanadium in the market which will enable you to add vanadium to your metals. This copper and vanadium alloy can be readily melted.

QUESTION No. 787. Will you inform me in the questions and answer column about an aluminum-bronze mixture that will give a color similar to 18 and 14 karat gold?

Answer. A mixture of 95% copper and 5% aluminum gives a color very close to 18 karat gold, while a mixture of 96% copper and 4% aluminum is undoubtedly the nearest approach to a 14 karat color known in any metal mixture used to imitate it.

QUESTION No. 788. In making up genuine babbitt-metal from tin, antimony and copper, is there any advantage to be gained in the use of the most expensive brands of antimony? It has seemed to us that the cheaper brands could be used to an equally good advantage.

Answer. You will obtain equally as good results with the cheaper brands of antimony in the manufacture of babbitt-metal. The only difference between the most expensive and cheapest brands of antimony is in the amount of impurities and it is so slight that no difference can be noticed in making an alloy such as yours. In making britannia-metal or similar alloys for rolling, the use of the best grade of antimony is advisable.

Question No. 789. We are experiencing considerable trouble in gold plating some badges made of soft metal. These badges are stamped from sheet metal. We wish you would inform us of the customary method of doing it.

Answear. The sample badge received from you has been made of an alloy of lead and antimony. You cannot deposit the gold directly upon it successfully, but should first give it a copper deposit in a hot, cyanide copper solution. This need not be more than a flash so as to cover it, and the metal must be thoroughly cleaned (by scouring with pumice if badly tarnished) and then coppered. After this has been done, you can gold plate it without difficulty. A gold deposit directly on the copper will have a red shade, and if you desire a yellow color, you will either have to deposit a large amount of gold, or give the medal a brass deposit previous to the one of gold. In this manner, the gold will have a yellow shade provided the right solution and right temperature have been used.

Question No. 790. Will you inform us whether there is anyone who can cast sterling-silver by the plaster process in articles from 6 to 10 inches in diameter, of pierced scroll work and of very light gauge, (about 20 Stubbs gauge)? We have been having the work done for us, but it is not very satisfactory as the entire surface of the pattern has not been filled. We have heard that such work is being done, but have not been able to locate anyone who can do it.

Answear. Your pattern is so thin that it hardly seems possible that it can be run in a plaster of Paris mold unless pressure is applied. As far as we know, there is but one concern in the United States who is casting sterling-silver in plaster molds by the pressure process and that is the Gorham Mfg. Co., of Providence, R. I. They use a patented process for the work.

Question No. 791. What is "soot" used in acid dips and is it used to any extent and if so, what is the advantage?

Answer. Soot is extensively used in acid dips and has been employed for many years. The kind of soot employed for the purpose is that obtained from chimneys in which hard wood has been burned. Soot obtained from the burning of coal is not suitable. When of good quality the soot has an appearance similar to small lumps of soft coal although much lighter in weight. Its value in a bright, acid dip is due to the fact that it produces nitrogen tetroxide gas and so changes the nitric acid from one that is pure to one which is yellow or red. It is well known that an acid dip works better when it contains this gas. If a red nitric acid is used in the first place, the use of the soot is unnecessary, but it is more convenient to use it. A dip thus made works smoothly and gives an even surface to the metal.

Question No. 792. How much zinc should be used in a good steam-metal mixture for making valves? What is the disadvantage of too much? I have been informed that too much zinc will cause the valve bodies to leak when tested.

Answer. In steam-metal, the amount of zinc should not be over 3%. If more is used the castings are apt to come dirty on account of the dross which forms in all mixtures containing zinc. It is caused by the oxide of zinc. It will readily be appreciated, therefore, that the more zinc the mixture contains, the greater will be the quantity of dross. Yellow-brass, which contains a large amount of zinc, does not produce as clean castings as the red metals that contain only a small quantity. It may be said that not over 3% or less than 2% of zinc should be used in the best steam metal.

Question No. 793. The brass plating solution that I found when I took a new position with a company making stamped steel goods works badly. It deposits zinc on some parts of the work, red on others and a little brass. On some pieces of the work there are the three colors. Have tried adding more carbonate of copper but it does not overcome it? Is the current at fault?

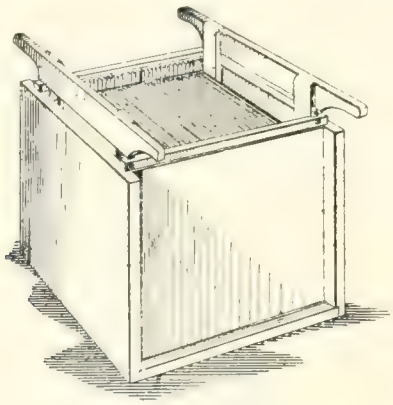
Answer. You need more free cyanide in your solution. When a brass solution deposits several colors at the same time it indicates that too little free cyanide is present. Your anodes will probably be found to have a white coating on them so that the current is impeded. This also indicates the absence of free cyanide in sufficient quantity.

Question No. 794. What is the most practical method of alloying zinc and iron?

Answer. The best method of alloying zinc and iron is to use wrought iron or low-carbon steel turnings. Place them in the bottom of a graphite crucible and the zinc on top. Then cover with a layer of charcoal. Heat to a temperature sufficient to melt the zinc and so that it just barely volatilizes. The charcoal will prevent oxidation at the surface. Keep the zinc at this temperature and the iron will gradually alloy with the zinc. It will take several hours for the zinc to dissolve much iron. Even then, but a few per cent will be absorbed. You can obtain an alloy of zinc and iron in the form known as "zinc-dross". This material is obtained in galvanizing and is an alloy of zinc and iron formed by the action of the molten zinc on the iron galvanized and on the kettle. It becomes so thick that it cannot be used. It usually runs from 3 to 6 per-cent in iron.

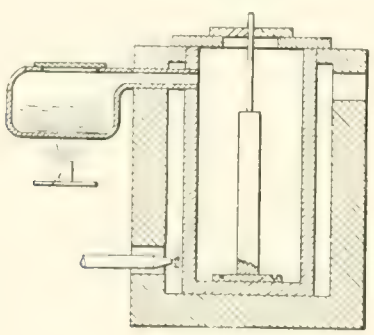
Patent Abstracts.

952,191, Mar. 15, 1910. APPARATUS FOR SILVERING GLASS PLATES. Manual Glaser and Bany Weinblatt of New York City. Assignors to the American Looking Glass Co., of the same city. The process consists in immersing a number of glass plates at a time in a tank as shown in the illustration.



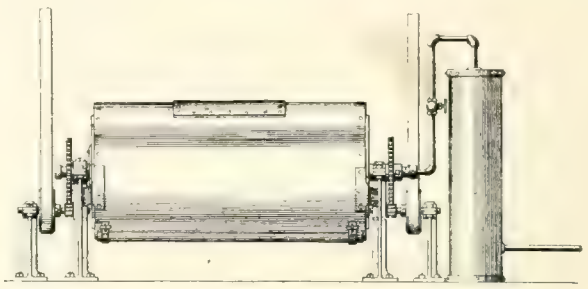
The whole batch .is thus silvered at a time When silvered, they are all lifted out together and dried. The face of the glass to be silvered is cleaned, rinsed with chloride of tin then rinsed off with water when it is ready for silvering. The silver deposits but little on the other side. It has been found (not claimed in the patent) that the chloride of tin produces a rapid and even deposit of silver, even though it is apparently all washed off.

949,837, Feb. 22, 1910. COMPOUND METAL AND PROCESS OF MAKING SAME. William M. Page of Philadelphia, Pa. Assignor to the Duplex Metals Co., of New York City. A method of making a compound steel and copper billet. The steel billet, used for the core, is cleaned by sand blasting, and then



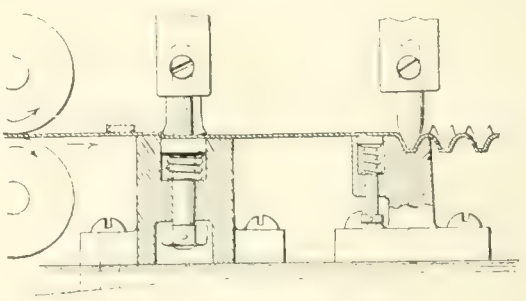
enclosed in an air tight chamber and the vapor of zinc passed in so that the surface becomes superficially coated. The billet, it is claimed, is then in a condition to allow heating to the temperature of molten copper, necessary for coating it, without danger of oxidation and preventing the union of the copper and steel.

952,351, Mar. 15, 1910. PROCESS OF DETINNING SCRAP TIN. Walter J. Phelps of Baltimore. The tin plate scrap is placed in a perforated tumbling barrel and liquid air is injected. It is claimed that at the low tempera-



ture thus produced, the tin becomes disintegrated and falls off and may be collected in the outer casing. It is claimed that the fine powder which is thus formed when the tin scales off sifts through the perforations.

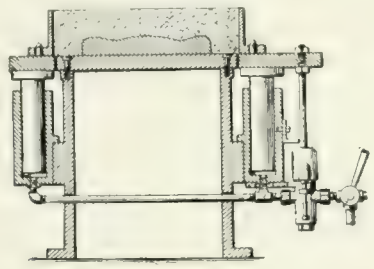
950,524, Mar. 1, 1910. METHOD OF MANUFACTURING STRIPS OF CONTINUOUSLY CONNECTED GEM SETTINGS. Wm. Whytock, Jr., of Providence, R. I. The



process consists of the use of two punches, one of which punches out the blank from a strip of metal, while the other forms the setting. The process is for the manufacture of ring or other settings for holding jewels.

950,341, Feb. 22, 1910. METHOD OF TREATING METAL PIPES. John S. Patterson, of Springdale, Pa. Assignor to the Enameled Metals Co., of Sharpsburg, Pa. A process of enameling iron pipes to be used for electrical conduits. The pipe is sand-blasted and then pickled, the ends threaded, a light coating of enamel applied and the couplings put on. A heavy coat of enamel is then applied. The object of the process is to prevent the usual injury to the threads during pickling and also to cover them with a thin coating of enamel which does not prevent the couplings from being screwed on.

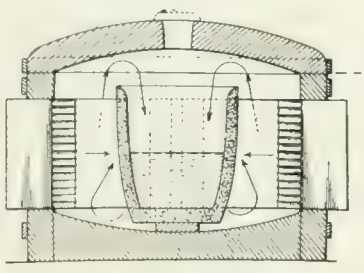
950,234, Feb. 22, 1910. MOLDING MACHINE. Wilfred Lewis of Philadelphia, Assignor to the Tabor Mfg. Co., of the same city. The essential feature of the machine lies in the use of mechanism so that the initial part-



ing movement shall be of a very gradual nature and finally accelerating into a more rapid movement. The capacity of the machine is thus increased without affecting the accuracy of the mold making. The operation thus imitates hand molding as far as possible.

952,906, Mar. 22, 1910. COMPOSITION. William Relfe Humphreys of Springfield, Mo. A composition for polishing metal and consisting of the following: Tripoli powder, 2 lbs.; camphor gum, 3 oz.; beeswax, 8 oz.; linseed oil, 1 pint; tallow, 2 lbs. These materials are mixed and rubbed on the metal with a rag in the usual manner.

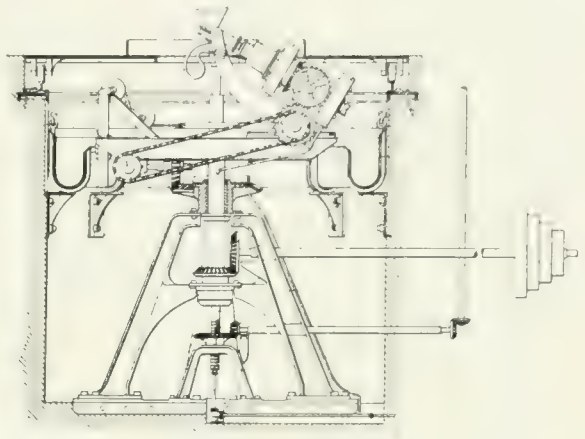
950,879, Mar. 1, 1910. ELECTRIC FURNACE. John Thompson of New York City. Assignor to the Imbert Process Co., of the same city. The novelty of this invention is in the construction of the furnace so that the



register, made of carbon, may be made of a plurality of parts which interlock one another. It is also placed in the furnace in a free manner and at the sides of the heating chamber. The construction of the furnace is such that it may be adapted to the various types, such as those used for melting or heating.

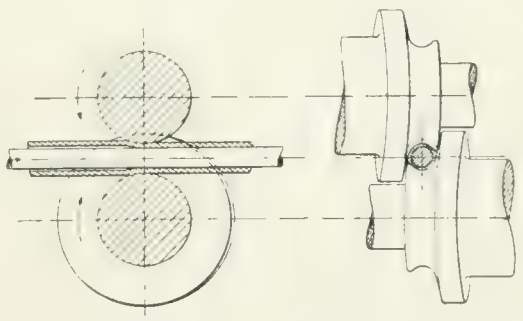
950,911, Mar. 1, 1910. INDUCTION FURNACE. Paul Gredt of Luxemburg, Germany. An improved induction furnace in which suitable means are provided for inserting the metal or ores.

950,884, Mar. 1, 1910. METHOD OF CASTING METAL BARS, WIRES AND PIPES. Friedrich W. Winner of Han-Yang, China. The metal to be cast is poured into a revolving mold as shown and it is claimed that the cen-



trifugal force exerted serves to assist in the discharge of the metal casting. The feature of the process is in the method of making the mold itself.

950,708, Mar. 1, 1910. PROCESS OF AND APPARATUS FOR ROLLING TUBES, SOLID ROUND BARS, AND SIMILAR BODIES. R. C. Stiefel of Ellwood City, Pa. A method of hot rolling seamless tube shells or solid rods. The feature of the invention



is in the application of rolling pressure on the sides of the tube or rod during its continuous passage through the rolls, and while in contact with them. The full specification is necessary to understand the details of the method.

951,824, Mar. 15, 1910. PROCESS FOR CLEANING ARTICLES OF METAL AND GLASS. Howard I. Manley of Webb City, Iowa. The process consists in immersing the articles in a solution of 97% bi-carbonate of soda and 3% of common salt. This is contained in a tin dish and the articles to be cleaned are in contact with it. An electrolytic action is thus set up which acts upon the metal to be cleaned, removing the foreign matter from its surface and precipitating it upon the tin.

Trade Items.

The Fostoria Glass Company of Moundsville, W. Va., are now manufacturing silver deposit glass ware for the trade.

The Electric Auto Horn Company has been incorporated in Zanesville, Ohio, with a capital stock of $10,000 to manufacture automobile horns.

The Tulsa Automobile Co., has been organized in Tulsa, Oklahoma, Ind., with a capital stock of $75,000 and will manufacture commercial vehicles.

Genin, Trudeau & Co., 22 Notre Dame St., West, Montreal, Canada, manufacturers of briar-pipes, are about to commence the manufacture of sterling-silver pipe ferrules and fittings for their goods.

It is reported that the Corbin Lock Co., of New Britain, Conn., has obtained control of the Brass & Steel Goods, Ltd., of Belleville, Canada. The interest owned by H. C. Hunt in the company has been purchased by W. C. Springer.

A new plant is to be erected by the Racine Iron & Wire Works on East Prospect St., Racine, Wis. In addition to ornamental iron and wire work, the manufacture of copper and brass work, fire-extinguishers and a similar line of goods will be made.

The Kann Bros. Silver Company, of 525 North Eutaw St., Baltimore, Md., are to discontinue their retail business and will now confine themselves to the manufacture of sterling-silver wares, silver-plated ware and Sheffield-plate.

The Electro Clock Company have removed their factory from Sparrows Point, Md., to Baltimore, Md., and are located at Calvert and Franklin Sts. The clocks they manufacture are self winding and have no springs. Dry batteries are used to operate them. At the present time all the parts are being made and assembled at their factory.

The Celluloid Zapon Company, 310 Fourth Ave., New York City are sending out to their customers and friends, a folder containing reproductions from photographs illustrating the manufacture of lacquers. Other folders will be sent out during the year and which will form a series illustrating the complete manufacture. They will be sent upon request to anyone interested.

J. M. Betton, 178 Washington St., corner of Dey St., New York City, has purchased the sand-blast business formerly conducted by C. Drucklieb. This includes the patents, good will and stock. Mr. Betton will carry on the manufacture and sale of these sand-blast machines and is prepared to fill orders promptly. The well known Injector Sand Blast is manufactured. Mr. Betton has had practical charge of the business of Mr. Drucklieb for the past five years.

The Mohegan Stove Company has been incorporated in Peekskill, N. Y., with a capital stock of $75,000 to manufacture stoves.

The plant of the Springfield Facing Company at Willimansett, Mass., manufacturers of foundry supplies, was recently burned with a loss of about $50,000.

A site has been purchased on Bell St., Columbus, Ohio, by the Ohio Metallic Specialty Co., which was recently organized to manufacture sheet metal office furniture, doors, windows, etc.

The C. F. Monroe Company of Meriden, Conn., manufacturers of cut glass and silver novelties, recently filed a petition for a receivership and C. F. Monroe was appointed receiver. Lack of sufficient capital to carry on the business is given as the cause of the difficulty.

The O. M. Edwards Company of Syracuse, N. Y., are to open a new department in which all kinds of steam metal valves will be manufactured for the trade. At the present time nothing but steam-metal valves will be made, but later the manufacture of iron and steel valves is to be taken up.

The new plant of the Frank Mossberg Company at Attleboro, Mass., was opened on March 2nd, by a formal dedication. The factory is situated on Lamb St., and occupies 55,000 square feet. It is one of the largest in the city. Special machinery, small tools, stamped goods and novelties are manufactured. Electroplating is also extensively carried on.

The MacFarland-Snyder Co., of Cleveland, Ohio, dealers in platers' and polishers' materials and machinery, have outgrown their present quarters at 1022 St. Clair St., and have moved to 803 St. Clair Ave., N. E., in that city where a larger building has been obtained. They will now carry an extensive line of factory and mill supplies as well as their regular line of polishing and plating materials and machinery. They also carry a line of brass founders' supplies.

A new concern called the A. B. C. Castings Company has been incorporated in Cleveland, Ohio with a capital stock of $100,000 to manufacture aluminum, brass and bronze castings. A site has been purchased at Carnegie and East 65th St., in that city and a plant will be erected. Nine brass furnaces will be installed and three aluminum furnaces. Five core ovens will also be erected. The contract for the foundry equipment has been placed with the S. Obermayer Co., of Cincinnati, Ohio. Ground has already been broken for the buildings. The officers of the company are: President, I. Levy; vice-president, T. L. Johnson; secretary and treasurer, A. D. Levy; and H. E. Behr, general manager.

France is about to commence the manufacture of aluminum coins and will issue a number of pieces of its minor coinage in this metal.

The coloring and plating business of Frank Stead of 220 Eddy St., Providence, R. I., has been sold to O. W. Miller who will continue the business as heretofore.

The Hudson Brass Works, recently incorpoted at 2 Howard St., New York City, is to manufacture brass fittings for the chandelier and plumbing trades and later will make automobile goods of brass. Shower bath fittings will also be manufactured.

A new nickel plating and polishing department is to be erected by the Globe Stove & Range Company of Kokomo, Ind. It will be installed in an addition 49 x 133 feet and the new equipment is to be of the most modern type.

The M. Blassberg Brass Foundry of Turners Falls, Mass., report an excellent business in their line and have recently installed five crucible furnaces for melting brass, bronze and aluminum. They are now making a specialty of aluminum castings.

An office in Philadelphia, Pa., has been opened by the Jonathan Bartley Crucible Company of Trenton, N. J., and is in charge of L. T. Ward. The office is located in The Bourse and the business in the city and surrounding territory will be looked after from it.

The Ohio Metal Co., 502 to 506 West Kimball St., Columbus, Ohio, smelters, refiners and dealers in metals and metal drosses, have purchased the entire plant, rights and good will of the New Process Metal Company of that city together with the formulas of H. G. Ridgeway of this company. One of the products is "Hy-Lo" babbitt-metal.

The John J. Jackson Company, 91 Mechanic St., Newark, N. J., manufacture "Fireless Sterling Silver Sheet" that needs no treatment in a firing solution after the goods have been made up. This silver is particularly valuable in the making of goods from thin gauge sheet as it then means that no waste is formed and much less work is necessary in their manufacture. They also manufacture silver anodes, silver wire, silver solders, granulated silver and pure shot copper for alloying.

The manufacture of molds for casting solder, babbitt-metals, pig and bar lead, tin, shot, piano-key leads, etc., has been the business of J. P. Fanning, 678 Jefferson Ave., Brooklyn, N. Y., for many years and most of the leading manufacturers of these goods have been supplied from his plant. The business has been specialized by him and when a satisfactory mold is desired, prices and descriptions should be obtained. The molds represent the most modern types for all purposes. In addition to the above lines, molds for casting gold or silver ingots are also manufactured.

The new catalogue No. 8 of the W. S. Rockwell Company, 50 Church St., New York City is being sent out to the trade. It illustrates the Rockwell forge shop furnaces.

A new factory for the manufactare of pins is to be built by the John M. Dean Pin Co., at Putnam, Conn. Among other products, the pins used on talking machines will be made.

Platers who have had experience in barrel plating and are desirous of obtaining a position will find an excellent opportunity in New York in this line. Particulars may be had by referring to the Want Advertisement column.

The Columbia Wire & Iron Works of Portland, Oregon are to move to their new factory at East 8th. and Market Sts., about the middle of May. It has been equipped with the most modern appliances for the production of ornamental wire and metal work.

J. Norris Scott of Kingston, Canada, analytical chemist and assayer, makes a specialty of the analyses of alloys, iron, steel, lacquers, etc., and also of electroplating solutions. In addition to the analysis of the solutions, he supplies expert advice on improving it. Mr. Scott is the chief chemist for the Crescent Wire & Iron Works of that city.

A tract of land at Sussex Ave., First and Dickerson Sts., Newark, N. J., has been purchased by the Whitehead & Hoag Company of that city and a large plant will be erected upon it. This company is one of the largest manufacturers of metal badges in the country and have an extensive plating department.

The business of Hemming Bros., Bradley and William Sts., New Haven, Conn., manufacturers of knife grinding and glazing machinery, has been incorporated under the name of the Hemming Bros. Company. O. L. Hemming is the president, R. B. Hemming, vice-president and treasurer, and Carl H. Hemming, secretary.

The Buffalo Dental Mfg. Co., 587 Main St., Buffalo, N. Y., are sending out a new catalogue and which describes their products in an excellent manner. It is devoted to laboratory and workshop appliances, such as gas melting furnaces, with and without blast, blowpipes, Bunsen burners, molds, gas stoves, blowers for foot and power and many other appliances. Many of their appliances will be found of great value in the plating room and the catalogue will be sent to those interested.

The famous Windsor Locks molding sand for the manufacture of fine brass castings is prepared for the market by the Rocky Hill Polish Company of Rocky Hill, Conn. This sand is used by all of the makers of fine brass castings in the East and produces the finest possible surface on them. In addition to this sand, the company produces buffing sand, polishing sand, sea-sand and red-grit. These are all prepared ready for use. They are sold by the barrel, ton or carload and correspondence is solicited. Those who are not using them will find it advantageous to give them a trial.

The American Seamless Wire Company of Providence, R. I., are to retire from business and their plant is offered for sale.

The Kaufman Metal Company has been incorporated in Jacksonville, Fla., with a capital stock of $50,000 to deal in old metals.

T. F. McGann & Sons Co., 104 Portland St., Boston, Mass., manufacturers of fine brass castings, are to build a new brass foundry in Somerville, Mass. It is to be 50 x 150 feet.

Krozin & Hill, 521 East 72nd St., New York City, have commenced the manufacture of metal novelties and have installed a plating plant.

The B. & B. Manufacturing Company, 50 Church St., New York City, are placing on the market a pickling solution for pickling metals and which has valuable features. It is called "Scalene.'

The Chicago Bearing Metal Co., 415 Old Colony Building, Chicago, Ill., with works at West Pullman, Ill., are sending out to the trade a booklet entitled "The Graphose Age" which describes the various babbitt and bronze bearing metals that are manufactured.

Owing to a typographical error in our March issue, the notice of the increase in capital stock of the Michigan Copper & Brass Company of Detroit, Mich., was incorrect. The article should have read that the stockholders voted to increase the capital stock from $800,000 to $1,000,000.

The Interstate Commerce Commission recently rendered a verdict in favor of A. Merle & Co., of San Francisco, Cal., manufacturers of brass bedsteads. The rate which they were paying on less than car load lots of brass covered tubing from New York to their city was deemed excessive at $1.85 per 100 lbs. and $1.75 was fixed at the maximum rate.

The New York Stencil Works, 100 Nassau St., New York City, desire to purchase sheet brass scrap of 18 or 19 B. & S. Gauge that is large enough for making brass checks. They are able to use this scrap to a good advantage in the manufacture of such goods, and will pay the market price for it. This is an opportunity for manufacturers to dispose of their scrap at a better price than they can obtain for it as scrap material.

R. H. Crothers and T. B. Haddow, Consulting Platers, 615 High St., West Hoboken, N. J., supply instruction in electroplating and coloring and formulas for same. A specialty is made of verdes, staining and finishing on chandelier and hardware goods. They are also specialists in the manufacture of silver deposit work and produce a silver paint for applying to glassware that really is white and not yellow. This paint has been in much demand for the production of silver deposit work on white glass ware. It is applied to the glass and the article is then fired, after which the necessary amount of silver is deposited by electrodeposition.

The Manitowoc Bronze & Steel Co., of Manitowoc, Wis., are to go into liquidation.

The Seymour Metal Goods Co., organized in Seymour, Conn., is to manufacture specialties in brass, German-silver and other metals.

An addition to the plant of the Arlington Stamping Co., at Arlington, N. J., is being erected.

The Newark Brush Co., of Newark, N. J., manufacturers of platers' and polishers' brushes, have removed from 12 Green St., to 253 Mulberry St.

Owing to the demand for electrical goods, the Star Brass Co., of Kalamazoo, Mich., manufacturers of trolley wheels and fittings, are to increase their plant.

The Indiana Lamp Company has been incorporated in Connersville, Ind., with a capital stock of $25,000. Automobile lamps and other brass goods will be manufactured.

The Acme Plating Works, recently burned out, have moved from their former plant at 17 John St., New York City, to 1838 Madison Ave., where business will be conducted until a permanent location has been obtained.

The Draper Mfg. Co., of Port Huron, Mich., are sending out to the trade their new catalogue describing the valve seating and regrinding tools which they manufacture. They also manufacture a line of solid and hollow brass balls for various purposes.

The new office building of the Hanson & Van Winkle Company at 269 and 271 Oliver St., Newark, N. J., is now practically completed and it is expected that it can be occupied about May 1st. The building is situated close to their manufacturing department which renders the new location particularly desirable.

The Turner Brass Works of Syracuse, Ill., have purchased the line of Champion gasoline torches formerly made by the Acorn Brass Mfg. Co., of Chicago, Ill., and which includes patterns, tools and good will. This company now manufactures 125 different styles of gasoline, kerosene and alcohol appliances for soldering, brazing and heating.

Hermann Blumenthal & Co., 241 Center St., New York City, manufacture brass, copper and steel wire brushes of large assortment for use in the plating trades. Scratch-brushes and bristle brushes are made for power and hand work and a full line of all kinds of brushes used in the plating trade is carried in stock. Repairing is carefully and promptly looked after.

The Continental Brush Company, F. A. Schmidt, proprietor, 114 N. J. R. R. Ave., Newark, N. J., manufacturer jewelers' and platers' brushes of every description, both for hand and power. As they are located in one of the greatest metal working centers of the United States, they know what is required in the line of brushes and their products are the result of much experience and study.

The brass foundry of W. C. Baker, Amesbury, Mass., was recently destroyed by fire.

The Moline Pressed Steel Co., has been incorporated at Moline, Ill., with a capital stock of $25,000 to manufacture pressed steel goods.

The Central Metal Works, recently organized in Harrisburg, Pa., are now operating their brass foundry and finishing department and the plant has been fully equipped.

The Schacht Mfg. Co., of Cincinnati, Ohio, manufacturers of automobiles, are to move their factory to Sandusky, Ohio, where, it is stated, new buildings will be erected.

Fritz Ehrsam, 434 East 165th St., New York City, architect, desires to obtain information from concerns manufacturing pressed steel goods as he is about to let contracts for a large quantity of such material.

The National Fulton Brass Mfg. Co., of Detroit, Mich., brass founders and manufacturers of car brasses, have purchased land in that city and will erect a new plant upon it to cost $100,000.

The D. T. Williams Valve Company of Cincinnati, Ohio, manufacturers of steam goods, are to erect a new plant on Hunt St., in that city. It will be 50 x 227 feet and four stories high.

The Niagara Metalware Company has been organized in Buffalo, N. Y., with a capital stock of $40,000 to manufacture metal specialties. The business of the O. K. Mfg. Co., has been absorbed by this company.

The new plant of Selzer & Co., at 12th. and Winter Sts., Philadelphia, Pa., is now occupied by them and to which they recently moved from 821 Cherry St. The manufacture of gas and electric fixtures is carried on. Art metal work is also one of their products.

A large tract of land has been purchased in Huntington, Ind., by the Locke Mfg. Co., of Robinson, Ill., and a large plant is to be erected on it for the manufacture of iron, brass and aluminum goods. Three buildings, 100 x 150 feet are to be built.

A change of officers in the Newark Brass Plate Engraving Co., 45 Lawrence St., Newark, N. J., has taken place. James N. Morehouse is the president; M. T. Morehouse, vice-president; and H. F. Van Sickle, secretary and treasurer. They have increased their plant so that it now occupies three floors 28 x 75 feet. The manufacture of etched name plates, signs and dials is carried on.

The Bayless Chemical Laboratory of Muncie, Ind., have one of the most complete plants in the country for the analyses of commercial products and the experience of their force is always obtained in addition to the actual analytical work. They make a specialty of doing the complete work for any manufacturing concern, and at this age of scientific knowledge, manufacturers will do well to investigate the proposition that they have to offer.

A new plant to cost $70,000 is to be erected by the Oscar Barnett Foundry Company in Newark, N. J., and which will be used in the manufacture of flasks and similar foundry equipment.

The Northwestern Brass Company has been organized in Indianapolis, Ind., by George W. Shelby, F. M. Dunn and R. E. Matthews. The capital stock is $10,000 and a general brass foundry business is to be carried on.

Personal.

L. Lambert has resigned his position as mechanical superintendent of the Victor Talking Machine Co., of Camden, N. J.

John H. Robinson has resigned his position as vice-president and general-manager of the Fairfield Aluminum Corporation of Fairfield, Conn., and disposed of his interest in the company. He will retire from active business.

John H. Way, who has been connected with the Waterbury Clock Co., of Waterbury, Conn., for 30 years and has had charge of the purchasing department, has resigned his position with this company and will locate in Denver, Colorado.

Harry Hoover, the well known foundry foreman, is now representing the S. Obermayer Company of Cincinnati, Ohio, manufacturers of foundry supplies and equipment. He is looking after the interests of the company in Buffalo, N. Y., and vicinity.

Joseph H. Hansjosten, who has been foreman of the plating and polishing department of the Rock Island Stove Co., of Rock Island, Ill., for a number of years, has resigned his position and has taken a similar one with the Automatic Electric Co., of Chicago, Ill.

George L. Wallace has resigned his positions as manager of the Eastern branch of the Dow Chemical Mfg. Co., at Bridgeport, Conn., in order to develop a number of inventions that he has recently patented and will later place on the market. He has been succeeded by William E. Gifford, who has been travelling representative of the company for some time.

Obituary.

Charles Loeb, president of the Zucker & Levett & Loeb Company, of New York City, died on Sunday, March 20th, at his home in that city. Mr. Loeb was president of the company for many years and was instrumental in bringing it up to its present magnitude.

Archibald M. Maddock, one of the foremost pottery manufacturers in the United States, died on March 25th, in Trenton, N. J., aged 54 years. He was treasurer of the Jonathan Bartley Crucible Co., of that city and also held the same position in the Thomas Maddock's Sons, and the Maddock Pottery Co.

Current Metal and Supply Prices.

These Prices are net and are for moderate quantities. Smaller quantities command higher prices. Prices subject to fluctuation.

Acetone, pure, 98-99%	lb.	.22
Acid, Acetic, pure, 30%	lb.	.07
Acid, Arsenious (White Arsenic)	lb.	.20
Acid, Benzoic	lb.	.55
Acid, Boracic (Boric), pure	lb.	.12
Acid, Hydrochloric, see Acid, Muriatic.		
Acid, Hydrofluoric, 30%	lb.	.04
Acid, Hydrofluoric, 50%	lb.	.10
Acid, Muriatic, 20°	lb.	.02
Acid, Muriatic, c. p., 20°	lb.	.07
Acid, Nitric, 38°	lb.	.05⅝
Acid, Nitric, 40°	lb.	.05⅞
Acid, Nitric, 42°	lb.	.06¼
Acid, Nitric, c. p.,	lb.	.08
Acid, Sulphuric, 66°	lb.	.01¾
Acid, Sulphuric, c. p.	lb.	.06
Alcohol, Wood	gal.	.50
Alcohol, Denatured	gal.	.55
Alum	lb.	.04
Aluminum, Sulphate	lb.	.06
Aluminum, Metallic, in Ingots	lb.	.23
Aqua-Fortis, see Acid, Nitric.		
Ammonia Water (Aqua-Ammonia), 20°	lb.	.04¾
Ammonia Water (Aqua-Ammonia), 26	lb.	.06¼
Ammonia Water, c. p.	lb.	.08
Ammonium Carbonate, lump	lb.	.15
Ammonium Chloride (Sal-Ammoniac)	lb.	.12
Ammonium Hydrosulphuret	lb.	.30
Ammonium Sulphate	lb.	.07
Ammonium Suphocyanate	lb.	.50
Amyl Acetate	gal.	1.85
Antimony	lb.	.08⅜
Arsenic, Metallic	lb.	.15
Arsenic, White (Acid Arsenious)	lb.	.20
Argols, White (Cream of Tartar)	lb.	.31
Asphaltum, Commercial	lb.	.05
Asphaltum, Egyptian (Bitumen)	lb.	.30
Benzine	gal.	.15
Benzol, Pure	gal.	.75
Bismuth, Metallic	lb.	1.75
Bitumen, see Asphaltum.		
Blue-Vitriol, see Copper Sulphate.		
Borax, Crystals or Powdered	lb.	.10
Borax Glass	lb.	.35
Cadmium, Metallic	lb.	.70
Carbon Bisulphide	lb.	.10
Calcium Carbonate (Precipitated Chalk)	lb	.10
Chrome-Green	lb.	.50
Copper, Lake, (carload)	lb.	.13½
Copper, Lake, (cask)	lb.	.13¾
Copper, Electrolytic, (carload)	lb.	.13¼
Copper, Electrolytic, (cask)	lb.	.13½
Copper, Casting, (carload)	lb.	.13⅛
Copper, Casting, (cask)	lb.	.13⅜
Copper Acetate (Verdigris)	lb.	.35
Copper Carbonate, dry	lb.	.25
Copper Sulphate (Blue-Stone)	lb.	.09
Copperas, see Iron Sulphate.		
Corrosive Sublimate, see Mercury Bichloride.		
Cream-Tartar, see Potassium Bitartarate.		
Cryolite	lb.	.12
Cyanide, see Potassium Cyanide.		
Dextrin	lb.	.15
Emery Flour	lb.	.04
Emery, F F & F F F	lb.	.03
Flint, powdered	lb.	.01
Fluor-Spar	lb.	.01¼
Fusel-Oil	gal.	1.75
Gold Chloride	dwt.	.60
Gum Copal	lb.	.30
Gum Guiacum	lb.	.26
Gum Mastic	lb.	.70
Gum Sandarac	lb.	.35
Gum Shellac, brown	lb.	.50
Gum Shellac, white	lb.	.60
Iron Perchloride	lb.	.25
Iron Sulphate (Copperas)	lb.	.05
Lead Acetate (Sugar of Lead)	lb.	.15
Lead, Pig	lb.	.04½
Lead, Red	lb.	.12
Lead, Yellow Oxide (Litharge)	lb.	.12
Liver of Sulphur, see Potassium Sulphide.		
Manganese, Ferro, 80%	lb.	.10
Manganese, Metallic, pure	lb.	.75
Magnesium, Metallic	lb.	1.50
Mercury Bichloride (Corrosive Sublimate)	lb.	.93
Mercury, Metallic (Quicksilver)	lb.	.50
Mercury Nitrate	lb.	1.50
Mercury Oxide, yellow	lb.	1.80
Nickel and Ammonium Sulphate (Double Salts)	lb.	.16
Nickel Carbonate, dry	lb.	.60
Nickel Chloride	lb.	.50
Nickel Metallic	lb.	.49
Nickel Sulphate (Single Salts)	lb.	.25
Nitre (Saltpetre), see Potassium Nitrate.		
Oil of Vitriol, see Acid, Sulphuric.		
Paraffine	lb.	.15
Phosphorus, yellow	lb.	.40
Phosphorus, red	lb.	1.10
Pitch	lb.	.05
Plaster of Paris, Dental	bbl.	4.00
Platinum Chloride	oz.	14.50
Platinum Metallic	oz.	29.00
Potash-by-Alcohol, in sticks	lb.	.50
Potash, Caustic (Potassium Hydrate)	lb.	.08
Potassium Bichromate	lb.	.14
Potassium Bitartarate (Cream of Tartar)	lb.	.31
Potassium Carbonate (Pearlash)	lb.	.10
Potassium Chlorate	lb.	.15
Potassium Cyanide	lb.	.25
Potassium Iodide	lb.	2.25
Potassium Nitrate (Nitre or Saltpetre)	lb.	.10
Potassium Permanganate	lb.	.17
Potassium, Red Prussiate	lb.	.60
Potassium, Yellow Prussiate	lb.	.24
Potassium Sulphide (Liver of Sulphur)	lb.	.15
Potassium Sulphuret, see Potassium Sulphide.		
Potassium Sulphocyanate	lb.	.70
Pumice, Ground	lb.	.05
Quartz, Powdered	lb.	.01
Rosin, Yellow	lb.	.04
Sal-Ammoniac, see Ammonium Chloride.		
Sal-Soda, see Sodium Carbonate.		
Silver Chloride, dry	oz.	.75
Silver Cyanide	oz.	1.00
Silver, Fine	oz.	.52½
Silver Nitrate, crystals	oz.	.50
Soda-Ash	lb.	.05
Sodium Biborate, see Borax.		
Sodium Bisulphite	lb.	.15
Sodium Carbonate (Sal-Soda), crystals	lb.	.02
Sodium Hydrate (Caustic Soda)	lb.	.05
Sodium Hydrate (Caustic Soda) by Alcohol (in sticks)	lb.	.45
Sodium Hyposulphite ("Hypo")	lb.	.04
Sodium Metallic	lb.	.90
Sodium Nitrate	lb.	.05
Sodium Phosphate	lb.	.09
Sodium Silicate (Water-Glass)	lb.	.04
Soot, Calcined	lb.	.15
Spelter, see Zinc.		
Sugar of Lead, see Lead Acetate.		
Sulphur (Brimstone) in lump	lb.	.05
Tin Chloride	lb.	.43
Tin, Metallic	lb.	.33⅛
Turpentine, Venice	lb.	.35
Verdigris, see Copper Acetate.		
Water, Distilled	gal.	.15
Water-Glass, see Sodium Silicate.		
Wax, Beeswax, yellow	lb.	.45
Wax, Carnauba	lb.	.70
Whiting (Ground Chalk)	lb.	.02
Zinc Carbonate, dry	lb.	.19
Zinc Chloride	lb.	,12
Zinc, Sulphate	lb.	.06
Zinc (spelter)	lb.	.05¾

THE BRASS WORLD AND PLATERS' GUIDE

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Scrap in Brass Melting.

While all brass rolling mills or brass foundries do not purchase scrap, they have more or less that results from their own operations, such as sprues, gates, risers, chips, sheet clippings, bad castings, or in the case of a brass rolling mill metal which has cracked in rolling. It is necessary to use these materials from day to day, and, in fact, in each melt or they will accumulate too rapidly. When used in the right manner, the scrap is as good as new metal and is of known mixture.

The best method of using the scrap seems to be imperfectly understood in some sections of the country, and in Connecticut, where the best practice in this line is supposed to be prevalent, the following method is employed, whether it is in a brass rolling mill or brass foundry making sand castings. The same rule applies to each, and also without regard to whether it is red or yellow metal that is to be melted. It is assumed, however, that the mixture to be made will consist of a certain portion of new metal and the remainder scrap:

Before placing the ingots of copper in the crucible, cover the bottom of it with scrap, and then cover with a small quantity of charcoal. On this place the ingots of copper but do not pack them tightly so that their expansion while heating will crack the crucible. The use of the scrap in the bottom of the crucible has a twofold value: First, it acts as cushion so that when the copper ingots are

placed in the crucible, it will not be injured. Second, and the more important feature, the scrap, on account of the zinc in it, purifies the copper as soon as melted so that it does not have an opportunity to oxidize. Zinc is a strong deoxidizing agent, and as the scrap metal containing it melts before the copper the molten copper, as fast as it forms, mixes with the scrap, and the zinc then reduces what oxide has formed. The charcoal also protects the melted metal from further oxidation. An additional feature in the use of scrap in the bottom of the crucible is that it assists the melting of the copper. It is well known that the molten scrap partly dissolves the copper before it is actually melted, so that the time of melting is really shortened when it is used.

When the copper has melted, further additions of scrap should be made and the whole surface of the metal kept well covered with charcoal. At no time allow the metal to become overheated but keep it well supplied with what scrap can be used so that it becomes heated scarcely above its melting point. The oxidation of the metal and absorption of gases are thereby avoided. When all the scrap has been added, allow the metal to heat up to the pouring temperature, then immediately remove from the fire and pour. If care is taken not to allow the metal to become hotter than its actual melting point until the whole amount of scrap has been added, and then to rise to its pouring temperature, the loss from bad castings will be reduced to a minimum.

Liver of Sulphur Solutions.

In the use of liver of sulphur solutions for oxidizing copper or silver, there are two things frequently done which are not conducive to the best results:

1. The use of the solution too long. Liver of sulphur changes upon exposure to the air, so that it does not remain uniform from day to day. During warm weather it changes quite rapidly. While it may work well when fresh, when it becomes old the results are apt to suffer. It is so cheap that it is poor economy to try to use an old solution, but it should be made up fresh from time to time as it becomes stale. During warm weather it is not superfluous to make it up fresh every day.

2. The use of too strong solutions. When copper is *immediately* blackened by the solution it indicates that it is too strong. The black deposit is then apt to be "sooty" and rub off. The best results are obtained by having the solution sufficiently weak so that the black color forms gradually, starting with an iridescence and passing through red, mahogany, brown and finally black. This transition does not take long and the results warrant it. The black color thus obtained is quite tenacious and will not flake off.

The American Foundrymen's Association Convention.

The convention of the American Foundrymens' Association, and its allied American Brass Founders' Association and Foundry and Manufacturers' Supply Association, which is to be held in Detroit from June 6th, to 10th, has been wisely changed from the middle of May, the time held last year, to this period as it is more seasonable. The meeting promises to be a very successful one and many interesting papers will be presented.

The headquarters will be at the Hotel Pontchartrain and many entertainments and excursions are to be held. The fact that Detroit is such a large and important brass center renders the meeting of more than usual interest.

The Foundry and Manufacturers' Supply Association have decided to use a tent for the temporary building and it will be of the size necessary for the exhibitions. Over 30,000 square feet of floor space have been asked for which is almost double that used at the last convention. A heavy timber partition will be put down the center of the tent so that it will act as a back wall for the exhibits, and aisles will then be laid at each side.

Frank T. F. Stephenson, 12 West Atwater St., is the Chairman of the local committee and from whom any desired information in regard to the Convention may be obtained.

Previous to the year 1814, over 1000 persons were employed in Birmingham, England in the manufacture of metal buttons of white metal and which were turned out on a lathe.

The Manufacture of Britannia-Metal and Other Soft Metal Sheets; Their Uses and Adaptability.

Few persons realize the large extent to which britannia-metal is now used and its adaptability to a large number of articles for which brass or copper is employed. In practically every household the metal is used in some form or other, but the fact that it is silver plated conceals the base metal so that unless one is familiar with metals, no attention is paid to the base metal and notice only is taken of the design and the character of the silver deposit itself. In the trade, it is stated that the base is "white-metal" and that when the silver deposit wears off, a white surface is left which will not readily corrode or tarnish. This fact is true, and it may rightly be said that to the britannia-metal base the success of much of the silver plated ware now sold is due, as it has made possible many beautiful and intricate designs which could not possibly be made of German-silver on account of the cost, nor of brass and copper on account of the fact that these metals would hardly form the non-corrosive metal that is necessary for such goods. That britannia-metal is adapted for the fabrication of beautiful wares, reference should be had to Fig. 2 in which a cream pitcher is shown. This article was manufactured by one of the largest hollow-ware makers and indicates how the metal is adapted for such work.

Years ago, much britannia-metal was used without any plating and it formed one of the standard materials for making hollowware. It was considered only second to sterling-silver itself. To-day more britannia-metal goods than ever before are manufactured, but owing to the fact that practically all are plated, the consumer does not know them under this name.

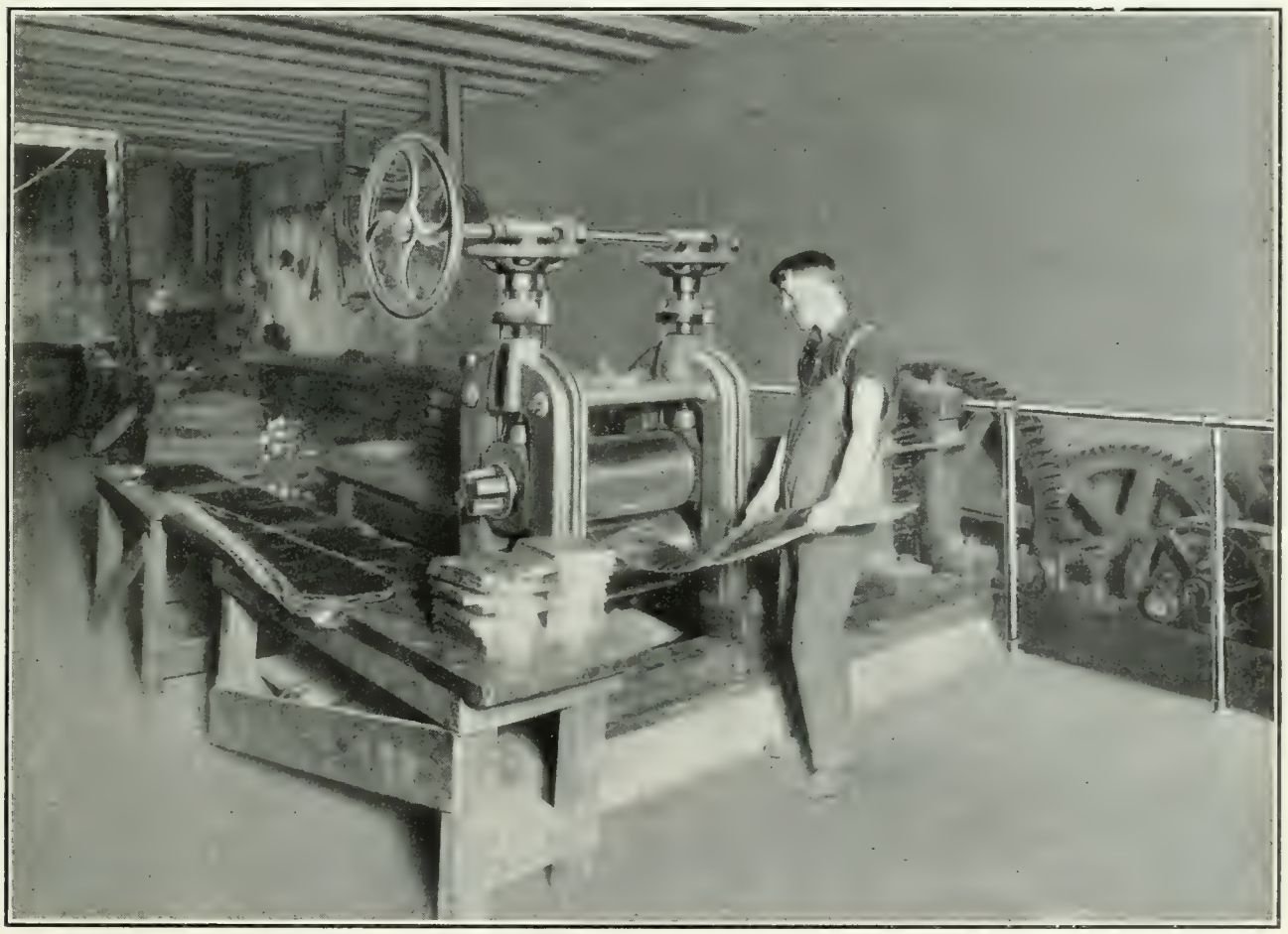


Fig. 1. Method of Rolling Britannia-Metal Sheet at the Works of the Standard Rolling Mills, Brooklyn, N. Y.

Undoubtedly the first metal to be rolled into sheet was pure tin as it is so soft that it responds readily. The first method of making

sheet metals was by hammering them out on a flat stone, and it was in this manner that prehistoric man made that which he used. The earliest record that we have of sheet metals being actually rolled indicates that many centuries ago, soft metals (tin undoubtedly) were rolled in Austria by means of wooden rolls. Little is known about such early metal working. Our accurate knowledge of the art dates back to the year 1770 when the manufacture of britannia-metal sheet was begun in Sheffield, England by two individuals by the name of Jessop and Hancock. At that time

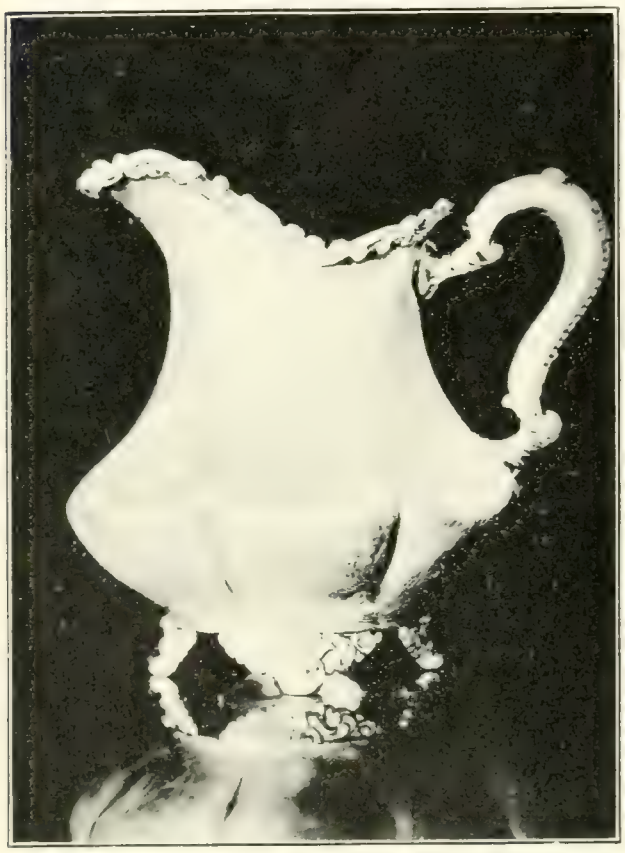


Fig. 2. Cream-Pitcher Made of Sheet Britannia-Metal and Silver Plated.

it was called Prince's Metal, but later the name of Britannia-Metal was applied which has remained ever since. In place of this designation the term, "white-metal" is frequently used, particularly by the workmen who manufacture it.

Britannia-metal, as the term is now used, contains tin, antimony and copper only. If it contains lead, it is known as pewter and for the majority of wares no lead is used, as it has been found that it softens the metal and darkens it. For the best classes of work, the purest possible tin, antimony and copper are employed. The proportions vary with the work for which it is intended. In case such work is to be made as that illustrated in Fig. 2 or in Fig. 3 no lead can be used, as the requirements of manufacturing are such that it has been found poor economy to use it. For cheap, stamped work pewter can be used.

Before describing the manufacture of britannia-metal, let it be fully understood why it is so advantageous for the manufacture of many classes of goods, and why it is so extensively employed; and also why it is preferable to brass, copper or German-silver for such work. The answer to these questions may be summed up in the three following reasons:

1. The metal is sufficiently soft to allow working into complicated shapes by spinning, by stamping or by drawing, without the necessity of annealing. Take, for example, a tray such as that shown in Fig. 3. The design on it and, in fact, the finished tray can be formed in one operation without any annealing, and without any danger to the dies. The detail is brought out as sharp and clear as though chased. Were brass or German-silver used, annealing would be required.

Fig. 3. Britannia-Metal Tray Made of Sheet Metal.

2. The metal allows the use of bronze dies of far less expense than those of steel, for the reason that they are cast practically to shape

and require only a slight amount of chasing to bring them to the desired finish. To make a steel die requires skilled labor and time with the accompanying cost. The britannia-metal, on account of its natural softness, has little effect on the die, and its life is very long. In working it, it may be said that the metal hardens to just the right amount so that when the article is completed, it has sufficient rigidity to hold its shape well.

3. The white color of the metal and its non-corrosive properties are such that it is adapted for many classes of work where brass or other copper alloys could not be used. It is the desire of manufacturers to produce goods in silver plate so that when it wears through, as it will in time, a white base metal will be left which will have a non-corrosive property and will remain white when exposed to the air. For this purpose there is no metal that could be used which would give even as good results as britannia-metal. Even German-silver would turn yellow. It is surprising how an exposed britannia-metal surface will remain white and it is to this fact, perhaps, that it is so extensively used in the manufacture of hollow-ware for household use.

When it is taken into consideration that britannia-metal can be worked into complicated shapes without annealing and that it has a white color that can be plated in any desired manner, it will at once be realized that the advantage may be summed up in the statement—it is cheaper.

Fig. 4 Steele-Harvey Melting Furnace for Melting the Copper Used in the Britannia-Metal.

The Manufacture of Britannia-Metal.

The successful manufacture of britannia-metal sheet requires the employment of new metals of the highest grade. The purest tin, antimony and copper are used. The metals are mixed in an iron kettle shown in Fig. 6,

but in order to melt the copper, a furnace capable of giving the necessary heat is required. At the plant of the Standard Rolling Mills, a large Steele-Harvey furnace using oil for fuel has been found quite satisfactory for the purpose. This furnace, with the method of lifting the crucible containing the molten copper, is shown in Fig. 4. The copper necessary for mixing with the tin and antimony can be rapidly melted in it and without regard to the weather such as would affect a coke furnace with natural draft.

The tin is melted in the iron kettle shown in Fig. 6 by means of coal and the copper and antimony introduced. After mixing thoroughly, it is ready for pouring into the molds. The molds used are shown in Fig. 6 and the metal is cast "flat" so that when the gate has been cut off it is ready for rolling. To cast a plate that will roll successfully and be free from flaws requires considerable skill and a knowledge of the proper heat. While it appears simple, only those skilled in the business can produce the desired results.

When the plates are cast, they are rolled down without annealing upon chilled iron rolls. These rolls are shown in Fig. 1 and are operated by overhead mechanism so that both rolls are adjusted at the same time. The rolls used by the Standard Rolling Mills are capable of rolling sheet metal up to 24 inches in width. This width is as large as the trade demands and the majority of sheet is comparatively narrow. The plates are all cast of the same width and widened out, when necessary, by cross rolling. During the rolling the sheet is hardened, but this acts advantageously in stiffening it for subsequent work.

The sheets, after rolling, are formed into coils for shipment and an assortment may be seen in Fig. 7 ready for sending to the consumer. Scrap from the working of the sheet metal can be returned for remelting and by careful melting and refining is cast again into new plates.

The manufacture of the britannia-metal, as previously described, seems a simple operation, but like other manufacturing operations contains "kinks" and difficulties which must be overcome before success can be obtained, and this success can be obtained only by long experience in the business. Both the casting and the rolling require careful treatment.

Press Working and Spinning.

The advantage of britannia-metal for press-working lies in the fact that it does not require annealing, nor does it affect the dies. Bronze dies can be used with excellent results and they are much cheaper than steel. In addition, they have a scrap value, when they become obsolete, which is practically that of new metal. They are extensively used for such work. In working britannia-metal in the press, a soft metal force can be used which greatly cheapens the process. Every detail of the mold is faithfully reproduced in the finished article and in practically one operation. No annealing is required and this fact

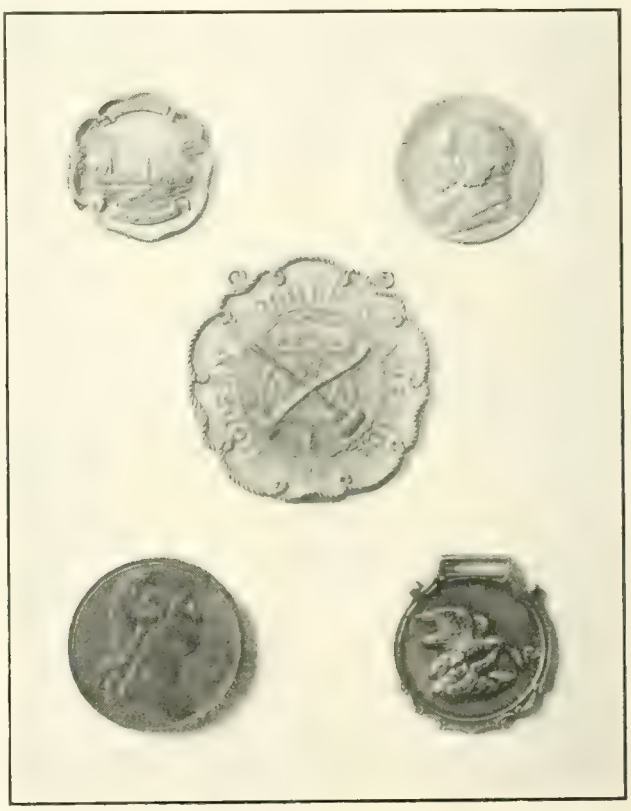


Fig. 5. Medals and Badges Stamped from Cheap Soft Metal.

in itself is a very important consideration. When brass or German-silver is worked in the press into designs, such as that shown in Fig. 3, in order to bring out the desired detail of the metal it requires one or more annealings, with the accompanying pickling, in order to produce the desired results. Steel dies and forces, too, must be used and with their consequent high cost and danger of breakage.

The spinning of britannia-metal is a simple operation and responds to the tool perfectly so that the finished article is made in one operation without removing it from the chuck.

With brass or German-silver frequent annealing is required in order to spin anything but the simplest shapes, and in addition there is always the danger of fire-cracking to which these metals are subject.

Soldering.

The soldering of britannia-metal is accomplished by ordinary soft solder. The best proportions for the work are 2 parts of tin and one of lead, as this has the lowest melting point of any of the series of tin and lead alloys. The flux best adapted for the purpose consists of the following:

Chloride of Zinc	1 part
Alcohol	1 part
Glycerine	1 part

This flux will flow readily and will not spatter. It is known as "Government Soldering Flux".

The majority of britannia-metal is silver plated, although any other deposit can be applied to it. Silver wares are now so extensively used that pure silver is the principal metal used for plating and on account of the white color of the britannia-metal base, is particularly suited for it. The method for silver plating is as follows:

The finished article is cleaned by scouring with a wet tampico wheel with fine pumice stone and water. This has been found by experience to be the most satisfactory method and is now exclusively employed for the work.

Fig. 6. Method of Pouring the Britannia-Metal Plates for Rolling at the Works of the Standard Rolling Mills, Brooklyn, N. Y.

Particular attention must be paid to reaching the background, as dirt accumulates there and must be removed, otherwise the silver will not deposit on it. When thoroughly scoured, the article is passed through a hot potash solution to remove any traces of grease left by the

hands, and then into a mercury dip known as the "quick or blue dip". This is made by dissolving a small quantity of corrosive sublimate and sal-ammoniac in water. The object of the dip is to coat the surface with a minute film of mercury to act as a binder for the silver. Without this dip, the silver plating will not be thoroughly successful and will be apt to peel or strip. When the article comes from this dip, which takes but a moment, it is rinsed and immersed in the so-called "strike" which is simply a silver plating solution containing very little silver. This covers the surface with a very thin silver deposit which adheres tenaciously; but owing to the fact that very little silver is in it, the deposit is not white and is quite thin. When the surface has been covered in this "strike", the article is transferred to the regular silver plating solution in which the silver is deposited in the desired quantity. For the best work, from 1 to 2 hours deposit are given, but for cheaper goods from 10 minutes to half an hour are required. The thickness of the deposit will depend upon the quality of the goods, and whether they are to be lacquered. The manufacturer can ascertain this point himself, however, and it may be well to add that for the best grade of goods a heavy silver deposit is put on as it will wear for many years.

Fig. 7. Rolls of Sheet Britannia-Metal Showing the Manner in Which It is Shipped to the Trade.

After the article has been plated, it is scratch-brushed, if it is to be sold for a high grade article, and then buffed with a soft wheel and fine rouge in order to produce the

highly polished surface necessary. The object of scratch-brushing is to matt down the silver deposit and render it hard so that the maximum wear can be obtained. Cheap work is plated in what is known as the "bright" silver solution and the deposit then requires no scratch-brushing, but is buffed directly. Cheap goods are usually lacquered to preserve them from tarnishing as the light silver deposit on them would not stand any polishing by the consumer when tarnished. The best grade of wares, however, or those upon which a heavy deposit of silver has been put, are not lacquered as there is sufficient silver on the surface to stand the cleaning and scouring that the average consumer might give them.

Copper plating and oxidizing are also used to a large extent in the manufacture of soft metal novelties from sheet metal and are even more readily carried out than the silver plating. For badges and medals it is extensively used. If the articles are plated when they come from the press, the oil is removed by immersion for a short time in a hot potash solution and usually no scouring is required. If, however, the surface is not bright, it must be scoured with wet, fine pumice stone and a brush. They are then copper plated. For this purpose the so-called "hot cyanide copper solution" is the best and is extensively used. When the desired amount of copper has been deposited, which usually takes but 5 or 10 minutes, they can be removed and oxidized in a liver of sulphur solution to blacken them, after which the exposed portions are buffed off leaving the background black and the exposed parts copper plated. They are then lacquered. Many other finishes may be put on, but the copper deposit is usually required as a preliminary treatment. If gold plating is to be done, it can be deposited over the copper, but should never be deposited directly on the britannia-metal without the preliminary coating of copper. Depositing the gold on the copper direct will impart a reddish shade to it, but if a yellow shade is desired, a light brass deposit is put on the copper and then the gold is plated on the brass. In this manner a beautiful gold color can be obtained.

Other Use of Britannia-Metal.

There are many uses for britannia-metal other than in the hollow-ware trades. It is extensively used in the soda-fountain trade on account of its non-corrosive property. Ornamental trays, medals, badges, etc., also form a large outlet. Coffin-plates are likewise made of this material in the form of sheet as it can be engraved after silver plating with ease and with the production of a white, finely polished letter. Various special britannia-metal mixtures are extensively used and one of the largest of this class is the so-called "music plates" upon which the majority of music sold is now printed. The softness of the metal allows the necessary engraving to be done upon it with ease and certainty.

The views herewith illustrated were taken from photographs made in the plant of the Standard Rolling Mills, Brooklyn, N. Y., which has been engaged for many years in the manufacture of white metal sheet, and which numbers among its customers some of the largest consumers of this material in the United States.

Application of Plastic Alloys in Ornamental Work

According to K. Friederich in *Metallurgie* an alloy consisting of 90 per cent of tin and 10 per cent of copper may be used for producing some new and beautiful results in ornamental work. This alloy has a eutectic point at 220 degrees C. and can be kneaded at this temperature as it is quite plastic. When mixed with powdered glass of a color other than white, some novel effects are produced. The mass is kneaded to mix and then compressed while at the aforesaid temperature.

On cooling and polishing, a material having a white ground with colored spangles distributed through it was obtained. Materials other than glass can, of course, be employed and different effects produced.

Another alloy containing 98 per cent of lead and 2 per cent of antimony was pressed at the eutectic point of 250 degrees C. with 10 per cent of iron filings and yielded a much harder lead mixture. The use of this mixture for a bearing metal was suggested.

The author states that many different results may be obtained by the use of various enamels, silicates or oxides when mixed with the plastic alloy.

As nearly all commerical soft solder is made from scrap, it contains small quantities of antimony and copper which detracts from its flowing qualities to some extent.

How to Use Chloride of Zinc in Melting Aluminum.

The use of chloride of zinc as a flux in melting aluminum has now become extensive, as it has proved to be the best known material for the purpose. Those who do not use it do not realize how satisfactory it is, and how much improvement it is capable of making in the aluminum.

The function of chloride of zinc as a flux in melting aluminum lies in its property of dissolving the oxide that forms on the surface when melted. Those who have melted aluminum are fully familiar with the amount of oxide that forms on the top of the metal. This oxide is not loose or in the form of powder so that it can be readily skimmed off, but is entangled in the metal so that a thick, pasty mass is formed. The result is that in skimming, a large amount of clean metal is unavoidably wasted and it is difficult to obtain a clean surface. The quality of the castings then suffers as this entangled oxide enters with the metal, but in the solid metal is hardly noticeable. While the casting may have a good appearance, it is lacking in strength on account of this oxide. The use of chloride of zinc, therefore, serves to increase the strength of the aluminum when cast.

It may be said that the use of chloride of zinc as a flux in melting aluminum accomplishes three things:

1. It reduces the amount of dross.
2. It produces clean castings.
3. It increases the strength of the castings.

The manner of using chloride of zinc could scarcely be more simple. When the aluminum has been melted, a small piece of this material is thrown on the surface and the metal at once vigorously stirred. The effect is immediately noticeable. The surface takes on a mirror like appearance, if sufficient chloride of zinc has been used, and it is ready for pouring. When the surface is bright and clean, a sufficient quantity of chloride of zinc has been added, but if it is still covered with dross, an additional quantity must be used.

The quantity of chloride of zinc needed for clearing the surface of molten aluminum is quite small and, in fact, is so small that its cost is a matter practically of no importance. Even were it an expensive material, (which it is not) it could still be used on account of the great benefit derived from it. Ordinarily the cost is almost too small to take into consideration in figuring the expense of melting.

The method of procedure in using the chloride of zinc is to purchase it in lumps. These should be kept in a closed bottle or jar, as it has a great affinity for water and soon becomes liquid. While the liquid may be used, the lumps are far better and easier to handle. When the aluminum has melted, take a piece of the chloride of zinc about the size of a walnut and throw on the surface. Handle it with tongs as it will injure the fingers after a time and cause the skin to crack. Now stir vigorously. A considerable quantity of smoke will be given off, but it will soon subside and the surface of the metal can be seen. This amount of chloride of zinc will usually suffice, but if the aluminum is not clean more must be added. It will usually take but very little to accomplish the results—generally an ounce or two will serve to give the desired mirror like surface to the molten metal. In this connection it may be said that after the chloride of zinc has been added, there is a slight boiling on the surface on account of the reaction which follows; the chloride of zinc turns black and floats to the side of the crucible, the oxide becomes powdery and can be readily skimmed off, so when the metal is ready to pour, it is as bright and clean as the surface of molten tin.

The formation of smoke is an objection, of course, to the use of chloride of zinc; but as it can be used while the aluminum is in the furnace, the smoke goes up the chimney. Even when used in the foundry, after the pot has been pulled from the fire, the amount of smoke is so small that it soon passes away and causes no inconvenience. It is no more harmful than the smoke from brass melting (fumes of oxide of zinc) and founders who use it have never complained about it. The results are so satisfactory, that what few undesirable features there are about it can be easily overlooked.

Although at one time pewter and britannia-metal were extensively used for spoons, practically none is now manufactured. Many of the older flat-ware manufacturers were engaged in making them at one time, but now German-silver has replaced these metals as it is stiffer and harder.

The Manufacture of Etched Novelties.

Etched novelties are now finding their way into the market, and up to this time have been the product, to a large extent, of the so-called "Arts and Crafts" companies, of which there are quite a number located in different parts of the country. These companies are usually small as far as a manufacturing industry is concerned, and they engage in the business of making metal novelties of various kinds of unique and exclusive patterns. It is owing to this feature that they have been able to gain a foothold, and their patrons have obtained wares not made by the thousands and sold in cheap stores. A purchaser, therefore, feels that he is obtaining something not found elsewhere. One of the products turned out by such a company is etched brass buckles and it can be said conscientiously that it is admirably adapted for the purpose, on account of the fact that hand work is employed in producing it, and the pattern may be varied at will.

Fig. 1. The Design Painted On.

The buckle herewith illustrated is taken as a type of an etched novelty, and the process of producing it may be applied to many other lines with equally as good results. In case the operator is possessed of an artistic temperament, he will find a large field in which to display it. The beauty of the work depends upon it. In the design herewith shown, no attempt has been made to display the artistic side to any special degree, but simply to illustrate the manner of making the article.

For the base metal let brass or copper be used, as these metals act without difficulty and can be afterwards treated by electroplating or coloring as may be desired. Sterling silver also may be used but it is more difficult to etch. Gold is still more difficult. In the process herewith described, sheet brass was used for making the article, although sheet copper may be used with equal facility.

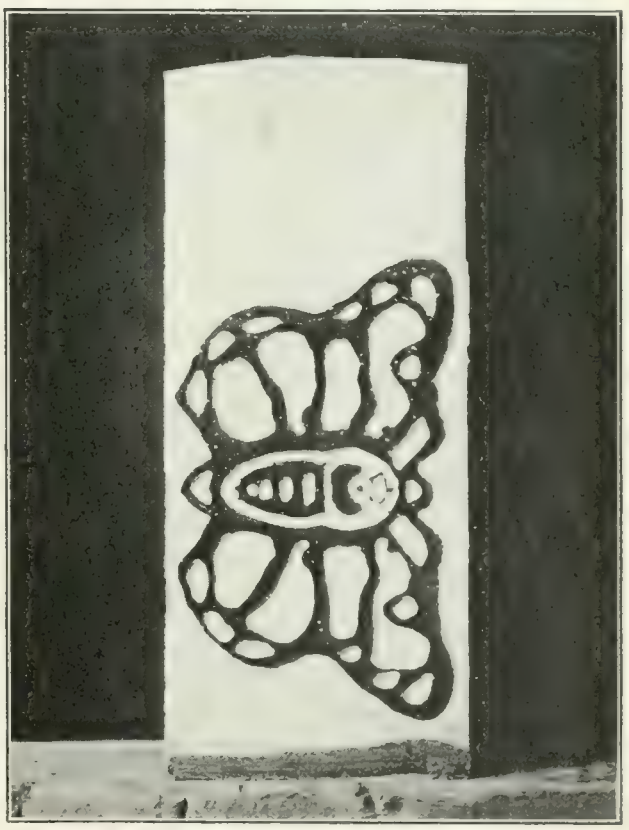


Fig. 2. After Etching.

Let it be assumed that a belt-buckle like that herewith illustrated is to be made from sheet brass. A piece of sheet brass of suitable thickness should be selected for the work. The surface must be smooth and clean. Any kind of brass may be used although that as free as possible from lead etches more easily.

If the etching is to be done electrolytically, solder a piece of copper wire to one end as shown in Fig. 1 in order to form a good connection. The brass sheet may be hard or soft as desired as the etching takes place equally as well with each. For most work a brass hard rolled is preferable as it then has

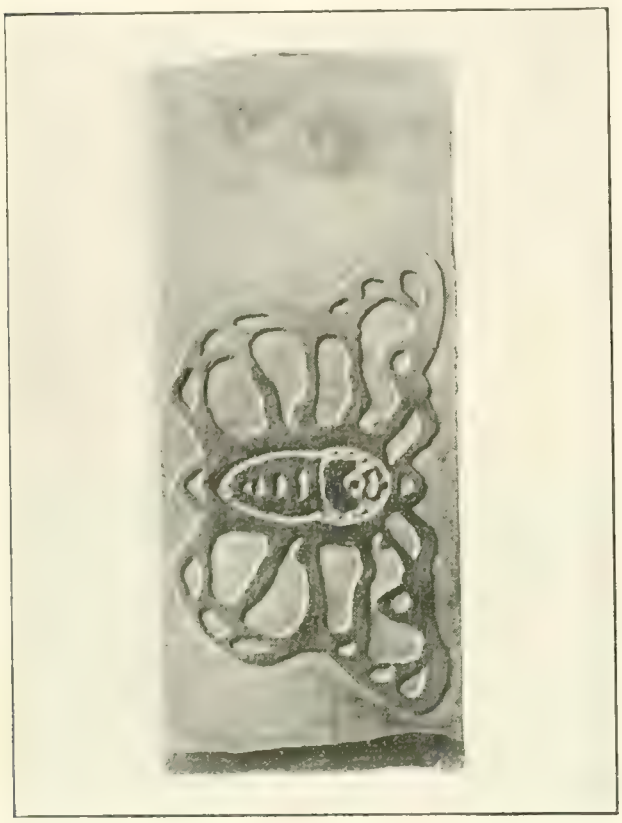


Fig. 3. With the Resist Removed.

a better finish and holds its shape. Before commencing, remove all grease and oil from the surface by washing with benzine. Then take a piece of fine emery paper and scour so that it is bright and uniform. A surface is thus produced which is slightly rough and the resist then holds better. When this has been done, keep the fingers off from it as much as possible in order to preserve it free from grease.

The first step is the application of the design with a material that will resist the action of the etching solution and allow the uncovered portions to become etched. For this purpose there is no better material than asphalt paint. It resists the action of the etching liquid to a remarkable degree and dries rapidly. The ordinary asphalt paint of commerce is used. If too thick it should be thinned with a little turpentine, but if too much is added it will be found impossible to keep it from "crawling" during the painting. This point, however, is not difficult to determine and all that is required is to have the paint spread readily with the brush. A thick coating of asphalt is unnecessary as even a thin coating which shows the metal as a brown color underneath resists the action of the asphalt well. Ordinarily, however, the coating will be black if the asphalt flows well. A good brush capable of making a fine, sharp line is required for the work.

If necessary the paint can be removed with a little turpentine and a fresh start made. Corrections may be made with a sharp knife before the asphalt has become completely dry. If done when it is hard, it is apt to flake off when cut and leave a ragged edge. When the design has been painted on, the appearance of the brass sheet will be like that shown in Fig. 1.

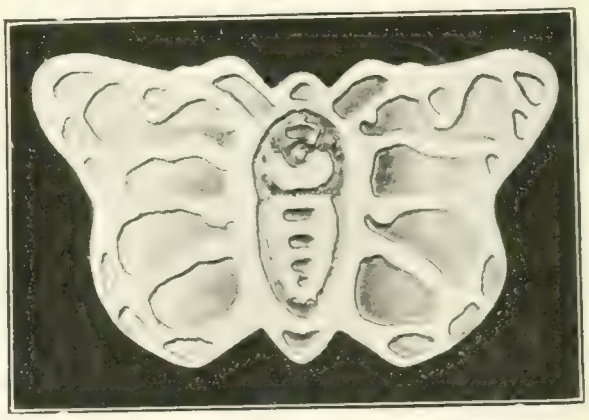


Fig. 4. The Finished Buckle.

When the design has been painted on with the asphalt paint and care has been taken to see that all parts are covered upon which no etching is to be done, the back of the brass sheet should also be given a coating of the asphalt in order to protect it. When this has been done the paint should be allowed to dry for several hours. It is preferable to allow it to dry over night when it will be found quite hard, although if the asphalt is good it will usually dry hard enough to allow etching in a few hours.

The next operation is the etching. This may be done in several ways. Electrolytic etching is the most rapid and was used in making the buckle herewith shown. For this purpose a solution of 9 parts of water and 1 part of sulphuric acid is used. Before using

it should be allowed to become cool. The article to be etched is made the *anode*. A sheet of brass or copper is used for the cathode. While a strong current may be used in the etching it is preferable to use a moderate one on account of the absence of difficulty when it is done. When a strong current is employed, the solution heats rapidly and is apt to soften the resist, and a clean etch is difficult to obtain because of the formation of a film over the etched surface after a time which impedes the action of the current and causes it to act unevenly. By a strong current is meant one with a tension of 6 volts. From 2 to 3 volts will be found preferable although the action is not as rapid.

During the etching a coating of insoluble material forms over the etched surface after a time. This is removed with a soft brush or by taking the brass plate out and rinsing in water. Unless it is removed from time to time, a smooth etch will not be produced. A good, deep etch usually takes several hours.

In case electrolytic etching cannot be used, then other solutions without the use of the electric current may be employed. One of the best for this purpose is a mixture of muriatic acid and potassium chlorate. It gives a beautiful matt etch, but owing to the gas given off is quite objectionable. It is, however, one of the best etching solutions known for brass. The proportions used are: Water 1 gallon and potassium chlorate 6 oz. It is allowed to cool after mixing.

Another solution which can be used is one of perchloride of iron made as strong as possible. This gives off no gas, but is rather slow in its action.

A good but slow solution is made by dissolving 1 lb. of bichromate of potassium in 1 gallon of water and then adding 8 oz. of sulphuric acid. When cool it is ready for use.

Nitric acid may also be used for the etching and for this purpose 2 parts of water and 1 part of strong acid are used. Its use, however, is not advocated for it leaves a rough etch and its action is more or less violent so that the resist is apt to be lifted.

In all the solutions used without the electric current, it is necessary to rock them while in use in order to produce an even etch. The solutions must also be used in tanks not acted upon by them. Glass, porcelain, stoneware or wood lined with asphalt answer for the purpose.

When the etching has taken place to a sufficient depth, as may be readily seen, the brass plate is removed, rinsed and a solution of equal parts of water and nitric acid flowed over it to clean off the discoloration. Then rinse again in clean water and dry. When thus completed it has the appearance shown in Fig. 2.

If the background is to be oxidised it is now a good time to do it before the resist is removed. The best method of doing it is to place the etched plate in an acid copper solution (the regular copper plating solution) and deposit a coating of copper upon it. The copper will not deposit on the asphalt nor affect it. Then remove, rinse and immerse in a liver of sulphur solution used cold. This is made by dissolving 2 oz. of liver of sulphur in 1 gallon of water. It is also possible to use a black nickel deposit for oxidizing or any of the well known coloring methods as long as they are used cold and do not attack the asphalt. If desired, the background may be colored by pigments after the resist has been removed.

The resist may now be removed by turpentine or benzol and the surface exposed. If the etching has been well done, it will be found in its original condition. After the asphalt resist has been removed the brass has the appearance shown in Fig. 3. The finish now used will be left to the desire of the operator and does not change the method of etching by the previous process.

In order to remove the buckle from the sheet, it is sawed around the outside with a fine jewelers' saw. This is a simple operation and takes only a few minutes. The edges are cleaned up with a file and then the sharp corners rounded off after which they are smoothed on a hard buff with tripoli. It is customary in the manufacture of such novelties to hammer the surface so as to produce a series of small dents and give them the appearance of "hammered" brass. This is readily done with a hammer having a round face. When completed, the buckle has the appearance shown in Fig. 4.

In an English patent, recently issued, the use of magnesium carbonate (magnesite) is claimed as a polishing material for metals. It is used in the form of cakes or bars and mixed with wax or soap for a binder, or it may be employed with water alone.

Application of High Pressure Gas to Furnace Work.*

By A. W. Onslow.

Many years of experience in the employment of coal gas for heating and melting purposes have led me to the conclusion that the methods commonly employed are not only wasteful of gas, but are incapable of giving anything like a constant temperature, where that is desired, or heating apparatus to the same temperature in the same time in consecutive operations. With the ordinary burner and gas of the same composition, the variation in time of heating a given furnace to a certain temperature may vary in consecutive days as much as two hours. It is impossible for the best of workmen to judge of the temperature or heating power of a flame by its appearance, or to regulate the air supply to a gas supplied directly from the main in which the pressure is constantly changing. Many times I have observed the erratic behaviour of gas-fired furnaces using raw gas from the main-variations of from 1200 to 1000 cubic feet per hour not being at all uncommon—with now and then an explosion, owing to irregular air supply. When such an accident occurred, several neighboring furnaces were generally put out of action.

To obviate these irregularities and fluctuations, I employ a high pressure gas capable of working up to 160 inches of water. High pressure gas lighting has a limit of about 60 inches water pressure. Air is drawn in at ordinary atmospheric pressure in both cases.

A rotary exhauster and compressor draws the gas from the mains and supplies it at any desired constant pressure to the burners. Any surplus gas is passed back again; and, therefore, does not interfere with the pressure as delivered from the burner nozzles, nor is it registered again in the meter. Variations of pressure in the mains have no effect. Until gas is supplied from the works at high pressure, a small apparatus similar to this is necessary if high pressure gas is to be employed. In Birmingham (England) Dr. Davidson, the chief .chemist to the Corporation, and Mr Barrett, the lighting superintendent, seem to be alive to the possibility, and a high pressure gas main is now being installed in that city. The gas meters for high pressures seem to present some difficulties, however.

Assuming the maximum consumption of gas in a small plant to be 500 cu. feet per hour, and that 100 inches pressure is sufficient to meet all conditions, the valve acts directly the machine is put to work, and if 300 cu. feet of gas is used, the surplus 200 feet is by-passed back into the inlet main. The pressure would, therefore be a constant one, whether one foot or 500 were consumed. The gas pipe need only be one-half the usual size, or half the size of the compressor outlet. The inlet pipe to the compressor should be of full size. Having fixed the compressor, any temperature can be obtained by simply turning on the gas tap. Assuming the highest temperature required to be 2600 degrees F. or thereabouts, 100 inches should suffice and that can be the standard pressure.

It might be argued; why not 100 inches for 1000 degrees F. as well as 2600 degrees F? It has been found at very high pressures crucibles are liable to be melted or distorted and for certain purposes it is better to work with gas under known conditions rather than increasing the temperature too rapidly and overheating some part of the article. With 100 inches pressure it is possible to soften the ordinary plumbago crucible in 30 minutes. There are, of course, cases where the pressure has necessarily to be raised and lowered. In the manufacture of glass, for instance, 10 cwt. or 20 cwt. crucibles should be treated at 60 inches pressure for 12 hours to melt the composition; 90 inches for 6 hours are required to refine the glass, followed by a drop down to 40 inches for emptying. This process has been found to work by the clock perfectly, and only the cost of town's gas has prevented its general adoption. If gas at 1 shilling 3 pence per 100 cubic feet could be obtained, glass could be made more cheaply by its aid than with coke at 15 shillings per ton.

In the melting of lead in cast-iron pots, 20 inches pressure is quite sufficient; but if it is obligatory to use 100 inches pressure, the heating must be by radiation and not by playing directly upon the iron kettle.

The following discussions of the paper took place:

Dr. W. R. Hodgkinson said that he had an installation of high pressure gas in his labora-

*Abstract of a paper read at the London meeting of the Society of Chemical Industry, Mar. 7th, 1910.

tory, driven by a 3 h. p. motor. He fully corroborated what had been said about the constancy of the temperature. He could keep the temperature in a small furnace within 2 or 3 degrees as measured by an iridium-platinum pyrometer, for a whole day, though the other gas in the laboratory might have to suffer.

Dr. W. B. Davidson said that in Birmingham they were trying to introduce high pressure furnaces for purposes of annealing, melting, case-hardening, brazing and such-like processes, especially in the Jewelers' quarter. They were now putting down a 24 inch high pressure main to be used partly for lighting and partly for heating. With high pressure gas, one could melt 10 lbs. of copper for less than a penny using gas at 1 shilling 6 pence per 1000 cubic feet. Carbon monoxide was a danger when there was leakage and, no doubt, as the chairman had hinted, it would be a serious matter to have a leak in a high pressure service.

Mr. T. Girtin said one very important application of high pressure gas had not been touched upon, namely, melting gold and silver bullion residues and gold and silver bullion itself. He had lately taken up the melting of those metals by high pressure gas, and could entirely corroborate what had been said as to its advantages. Gas had been used for those purposes before, chiefly in America; but there the air was generally put under pressure and the result was that high velocity of the burning gases threw the volatilized gold and silver about considerably and made it difficult to collect. It was very important in melting a large quantity of gold and silver not to dissipate this volume, which impregnated the pot and everything else. He found the high pressure gas slightly more expensive than coke for melting purposes, but its great advantage was in its cleanliness. If gold and silver were melted with coke, the whole of the ash from the coke had to be treated afterwards. He had treated as much as 90 or 100 tons of that ash in a year, so that he found a very great saving by the use of high pressure gas. He used only about 12 or 14 inches of water pressure, and under those conditions found no noise whatever. He had tried gas under air-blast and oil under air blast, but had abandoned both in favor of this comparatively moderate pressure gas.

Casting Room Floors.

The rapidly extending use of concrete for structural work has resulted in its employment for many other purposes for which it is unsuited. One of the most unsuitable places in which it can be employed is for the floor of a brass casting shop. While good for some kinds of mill floor, perhaps, when used in a casting shop its life is short and it soon becomes annoying.

In a brass casting shop, the floor is subjected to two severe conditions: First, hot crucibles are set down upon it, metal is skimmed on it and considerable quantities of hot metal are frequently spilled either by the breaking of a crucible or by its slopping over when being carried to the molds. Small quantities of hot metal chill so rapidly that they have little effect on the concrete, but larger amounts will always cause it to crack, and if the metal finds its way into a crack, the results are worse.

The second obstacle is the hard treatment that the floor receives by the dropping of ingot metal, molds, scrap etc. upon it. This sooner or later causes holes to form in the concrete which then gradually grow larger. Taking the hot metal spilled on it and the pounding the floor receives, it is not surprising that it is short lived.

The best material for a casting shop floor are cast-iron floor plates, grooved so that they will not wear smooth. They should be about an inch in thickness in order to prevent breakage, and as flat as possible. In justice to the majority of brass manufacturers it may be said that they fully appreciate their advantages and use them to a large extent. Their life is very long so that it may be said that they are practically indestructible. In case such plates cannot be obtained, then a good, hard paving brick laid as close as possible is the next best thing and will be found much superior to concrete as they will stand the heat.

Although little is known about the effect of vanadium on aluminum-bronze, it has been stated that an aluminum-bronze containing 91% of copper, 8% of aluminum and 1% of vanadium has a tensile-strength of 123,000 lbs. per sq. in. (45 English tons) and 12.5% elongation. This strength is said to be possible on cast metal.

Zinc Dust in Recovering Gold from Cyanide Solutions.

Zinc has the property of precipitating gold from cyanide solutions, and it is possible, by employing it, to recover all but a trace of gold from them. It is useful, therefore, in reclaiming the gold from old plating solutions. For this purpose, there is nothing better than fine zinc chips as they present a large surface and are easily removed from the solution, but in many instances they are difficult to obtain. In place of it zinc dust may be used. This material may always be obtained from dealers and is cheap.

The method of using the zinc dust in the gold plating solution is to place it in the cyanide solution from which the gold is to be recovered and stir frequently. The amount needed is small. From ½ to 1 oz. to the gallon of plating solution will suffice. The operation is carried out cold, and after the zinc dust has been added, stir from time to time and allow to remain several hours. Then the gold will have been precipitated on the zinc. Siphon off the clear liquid and add clean water. Stir and allow to settle. Then siphon off the clean solution as before. This is repeated several times until the zinc has been washed. The best method to follow at this point is to filter and wash well, although not absolutely necessary.

The zinc dust remaining has the gold precipitated on its surface. To remove the zinc and leave the gold it is treated with dilute nitric acid. Equal parts of pure water and pure nitric acid are used. Do not use commercial acid, as it is apt to contain a little chlorine which will form aqua-regia and dissolve the gold. The zinc dust is placed in a porcelain dish and the nitric acid added and the whole warmed until no more action takes place. Then add more of the dilute acid to see if everything has been dissolved, and if no further action takes place the operation is completed.

Now add twice the amount of water that there is solution in order to prevent the acid from acting on the filter, and allow to settle, then pour off the clear liquid and filter the rest through filter paper in a glass funnel. Wash a number of times with clean water and the pure gold will be left. It is usually in the form of a black powder, on account of its fine state of division. If desired, it can be melted down in a clay crucible with a little borax as a flux and a button of the pure gold will be left. If it is desired to make chloride of it, the melting is unnecessary although preferable as it enables one to see if pure and yellow.

Automobile Bushings and How to Make Them.

In automobile construction there is a demand for a high grade bearing bronze and it is cast principally in the form of bushings. They are usually small. The requirements of such bushings are severe, as oil may not be used as often as necessary on them and the pressure is considerable. Taking everything into consideration as good metal as possible should be used for them. The following mixture has been found to give excellent satisfaction:

Copper	80 lbs.
Tin	5 lbs.
Lead	10 lbs.
5% Phosphor-Tin	5 lbs.

Use new metal only. Keep the mixture free from zinc as it will tend to make the lead sweat out. Cast at as low a heat as possible and good castings will be obtained. The molds, whenever possible, should be faced over with a good graphite blacking in order to prevent the sand from adhering. The castings will then be smooth. Green sand can be used for making the castings.

While the castings may seem soft in machining, the presence of lead will give the bearing a long life and freedom from heating and wear.

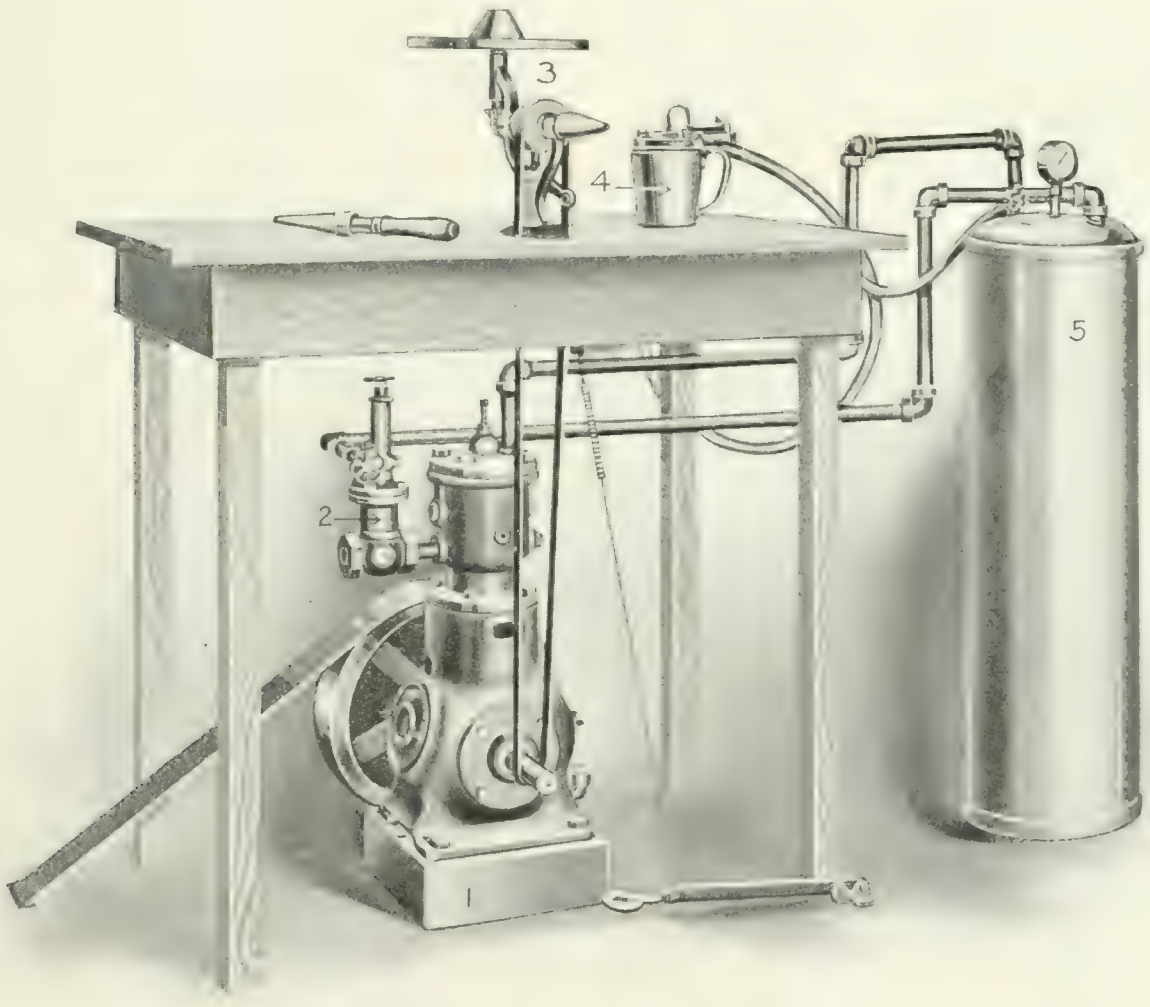
For stamping soft metals, bronze dies are now extensively used and are much cheaper than steel ones, on account of the fact that they can be cast nearly finished.

In 1818 the art of gilding brass buttons in England had arrived at such a condition, as far as refinement was concerned, that "three pennyworth of gold", as an early writer has said, "was made to cover a gross of buttons". It was furthermore said that "the experiment has been tried to produce *gilt* buttons *without any gold;* but it was not found to answer, the manufacturer losing more in the consumption than he saved in the material."

The Up-to-Date Method of Applying Lacquers.

By G. J. Nikolas.*

Having received a great number of requests for information relative to the application of lacquers by means of the air-brush or spray, and finding it difficult to convey a comprehensive idea in a word picture, we decided to install the plant as herewith illustrated which enables us to give a practical demonstration to those who can call at our factory.



The "Nikolas" Apparatus for Applying Lacquer by Means of the Air Brush or Spray.

Lacquer, as well as varnish, paint, japan, bronzes etc. can be successfully applied by spraying, with a great saving of labor and the results are far superior to the old methods. There are very few articles that cannot be successfully lacquered by this method. The application of lacquers by means of a spray is not an experiment. A number of large metal goods manufacturers have been using this method with success for several years. I do not know of one who is not highly pleased with the results.

Every person who has applied gold and black lacquers knows that it is impossible to apply them without showing streaks. This is due to the fact that the lacquer is not laid on evenly. The same trouble is experienced with transparent lacquers; but owing to their transparency the streaks are not so noticeable, except when too little lacquer is carried in the brush. In this case, the brush splits and leaves fine hair lines where no lacquer is applied. The bare metal thus exposed will soon tarnish and ruin the appearance of the goods. These faults, as well as others, are practically eliminated by the air-brush.

Another great advantage of the air-brush or spraying method is that the lacquer is

*G. J. Nikolas & Co., 1227 Van Buren St., Chicago, Ill.

always clean. When lacquer is applied with a brush only the first brush full is absolutely clean. Inspect the lacquer in any cup that has been in use for several hours and considerable dirt will be found in it. This dirt is applied to the metal with the lacquer, and in consequence the article lacquered last is inferior to that first treated.

It takes about 25 per cent more lacquer for the same amount of work with an air-brush than with an ordinary brush. About one-half of this excess goes to the metal and the balance is wasted. It saves nearly 50 per cent over dipping. Compared with the ordinary process of applying lacquers with a brush it will save from 25 to 50 per cent in labor. A plant that is kept busy will pay for itself in less than two months in the saving of labor. In the number of plants that have been installed during the last year, all of them have given excellent satisfaction and I am convinced that this is the coming method of lacquering because it is an important and a labor saving device.

The apparatus herewith shown was designed and constructed at our plant in Chicago in order to demonstrate the value of the air-brush and to give a practical working test to customers who desire to investigate the merits of the process.

How Radium Occurs and is Sold.

It is the general belief that metallic radium is found in commerce. This belief is erroneous as the radium-barium-chloride is the material almost universally produced for commercial purposes. The following report, recently made by U. S. Consul George N. Ifft of Nuremberg, Germany, will serve to clear up some of the doubtful points on the subject:

Radium is one of the most expensive things in the world, and the Austrian Government has just fixed the price for a milligram (the one-thousandth part of a gram) at 400 crowns ($81.20). It is impossible to deliver radium in absolutely pure form, and it is therefore prepared for sale in a chemical combination and, as a matter of fact, as radium-barium-chloride. At present this radium preparation is manufactured in forms and qualities which are certified and guaranteed by the government institute of the Vienna University. Each radium preparation is inclosed in a round, so-called radium cell, which has a diameter of 21 millimeters (millimeter= .03937 inch) and a thickness of 9 millimeters. These cells are made in the form of a case that screws together, the material of which is nickeled brass; the bottom of the cell is run full of lead, in which is sunk a small square hole, and in this hole is stored the radium preparation. This radium cell is then closed with a mica plate, and it is thus not necessary to open this cell in order to utilize the radium ray. Every radium preparation is also officially stamped and consecutively numbered. These precautionary measures and rules are regarded as necessary on account of the unusually powerful chemical action of radium and that no unforeseen injuries may result through careless handling of the same.

To purchase radium from the Austrian Government one must have more than just the necessary money to pay the price, for in order to guard against the misuse of the same, this rare mineral will be sold only to scientific institutions or to learned men. Delivery is made at the risk of the purchaser, and as yet there are no rules regulating the use of the mails for such purpose. Up to date not even a single milligram of radium has ever been sent by mail. It has always been forwarded by special messenger. Such was the case when the Austrian Government sent a large quantity of radium (2 milligrams) to Paris as a gift to the Curies for experimental purposes. This was about a year and a half after the latter had discovered radium and still at a time when the new mineral could not be purchased. An assistant at the government institute at Vienna then carried the precious stuff to Paris in a tiny capsule. Since that time radium has become relatively cheap. Under the quotations of the Austrian Government it is worth only about $36,500,000 per pound.

Brass pins were first made by holding a piece of wire of suitable length in a vise and then upsetting the head by a hammer. The point was then ground on a small grindstone. such pins were known as "hand-made." They were quite clumsy compared with those made. at the present time.

A New Method of Galvanizing.

A new method of galvanizing iron or steel has been discovered by Leland M. Willey of the General Electric Co. of Schenectady, N. Y. and which, it is stated, is free from the objections of the ordinary processes of galvanizing. The deposit produced is said to be free from crystallization like that formed in hot galvanizing, and the surface of the iron or steel to be galvanized does not require the careful cleaning that is necessary in electrogalvanizing. In fact, the discoverer states that a slight film of oxide on the iron or steel tends to accelerate rather than retard or prevent the adherence of the zinc to it. The method of galvanizing by the process is as follows:

A molten bath is provided consisting of 100 lbs. of zinc chloride. It is heated to about 500 degrees F. (its melting point) until in quiet fusion and the water it contains is driven off. From 10 to 50 lbs. of zinc dust are now added, and then, in order to increase the fluidity of the bath, from 3 to 10 parts of sal-ammoniac (ammonium chloride) are introduced.

When the bath has come to a quiet fusion, the iron or steel articles to be galvanized, are immersed in it and allowed to remain for the necessary length of time. It is stated that for ordinary work, such as nuts or bolts, half an hour is a sufficient length of time. Previous to the immersion of the objects to be galvanized, they are freed from scale and rust; but as previously mentioned, a slight film of oxide is not objectionable.

When completed, the object will be found coated with a very even coating of zinc which cannot be chipped or scaled from the iron or steel surface. It is also smooth and free from the crystallized character of a hot galvanized coating. Threaded articles may be readily treated by the process as the threads are not filled up. When taken from the bath, the object is immersed in water to remove the adherent zinc chloride when it is dried and the operation is completed.

This process seems to be intermediate between galvanizing and sherardizing. The discoverer has been granted a patent upon the process. (U. S. Patent, 955,446, Apr. 19, 1910.)

A Hinged Mold for Casting Brass for Rolling.

The mold almost exclusively employed in brass rolling mills for casting brass for rolling into sheet, is made in two parts and fastened together, when used, by iron bands and wedges. It is somewhat difficult to handle as one half must be swung away from the other in order to clean and oil it, or to remove the bar or cast brass. A hinged mold for this purpose has been patented by Peter H. Allison of Torrington, Conn. (U. S. Patent 954,368, Apr. 5, 1910) and is herewith illustrated.

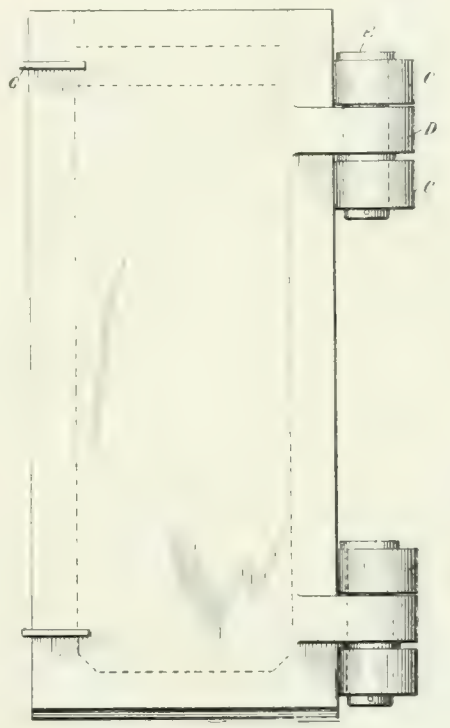


Fig. 1. Front View of the Hinged Mold.

In Fig. 1 is shown the front view of the mold and it will be noticed that it resembles an ordinary mold except that hinges are placed on the side. In Fig. 2 an upright cross-section is given while the horizontal cross section is illustrated in Fig. 3.

Heretofore, the difficulty in the use of a hinged mold has been to allow for the expansion of each half during the heating and cooling and also to produce a tight joint so as to prevent the formation of fins on the cast bar. In the present invention, these difficulties have been overcome. These joints may be seen in Figs. 2 and 3 as F1 and F2 and they are made with sufficient clearance so that when the mold is opened and closed, they do

not bind, and at the same time a tight fit is produced so that fins are avoided.

The mold is held together with iron clamps on the side and the back half is made slightly

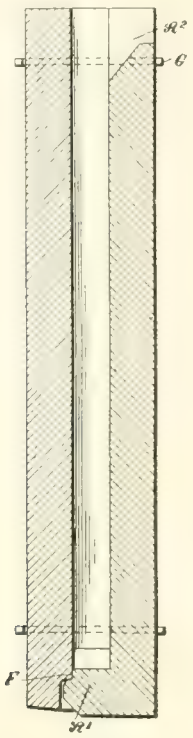


Fig. 2. Vertical Sectional View of the Mold.

longer than the front so that the latter may be readily swung back and forth without coming in contact with the base upon which the whole mold rests. It may be mentioned

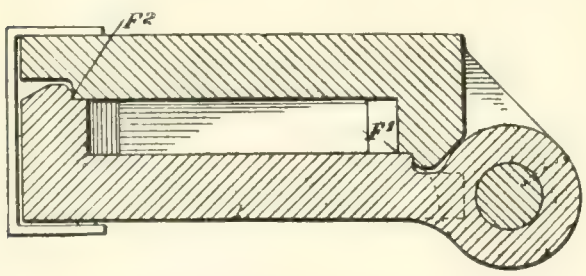


Fig. 3. Horizontal Cross-Section of the Mold.

that in order to produce the necessary tight joints and clearance previously mentioned, considerable machine work is necessary on the mold.

At one time, sterling-silver was melted by using a piece of tool steel on the surface to indicate the right pouring temperature. When the steel sparkled, the silver was poured. This method is not used at the present time as it has been found that such a heat is too high and not only causes blisters, but small particles of the steel enter the silver.

A Mixture for Bronze Dies.

The following mixture for making bronze dies for use in stamping soft metals, thin sheet brass and other substances has been found excellent as it is hard enough for the purpose, and yet not so hard that it cannot be chased out to finish it. In addition to these features, it is not a difficult metal to cast. In this respect it is much superior to aluminum-bronze, which although satisfactory as a die, is very difficult to cast on account of its shrinkage.

The die mixture is as follows:

Copper	85 lbs.
Tin	15 lbs.
Aluminum	2 oz.

While it may be made up by melting the copper, then adding the tin and lastly the aluminum, in case a small quantity is to be taken, the amount of aluminum becomes so small that it is difficult to weigh it. It is preferable, therefore, to make up a rich tin and aluminum alloy and then use it for adding the aluminum to the mixture. This rich alloy is made as follows:

Tin	9½ lbs.
Aluminum	½ lb.

The two metals are melted together and poured out into bars after which they are cut up for adding to the following mixture:

Copper	8½ lbs.
Tin	1¼ lbs.
Alloy	¼ lb.

The copper is melted first, then the tin is added and lastly the alloy after which it is poured into the molds. The best results in molding are obtained by the use of molds faced with Windsor Locks sand and skin-dried.

For making silver for silver deposit work, the best method of obtaining it in the necessary fine state of division is to precipitate it from its solution as nitrate by metallic copper.

Babbitt-metal is named for Isaac Babbitt who was the first to use a soft metal alloy in bearings. He patented the use of soft metals in bearings in 1839 and claimed no particular mixture, but recommended one of 50 parts of tin, 5 parts of antimony and 1 part of copper. This mixture is somewhat softer than what is now used.

The Manufacture of Ribbon Lead in England.*

The use of shredded or spun metals enters every day more largely into the general economy of the metal working world. Up to the present time the general method of obtaining this shredded metal has been by spinning in a lathe, and although in many cases the products have answered their purpose well, in many other cases the mere operation of cutting the metal in the lathe has tended to nullify in a great degree the virtues of the metal itself. This is more especially noticeable in the spinning of lead, zinc, and other easily malleable and ductile metals. Stripped or shredded lead is, on account of its malleability, very largely used in various methods of handling and working metals; but, unfortunately, its malleability, which is its chief consideration, is to a very large degree spoiled by the process of preparation. As we have said, the general process hitherto of preparing shredded lead has been by cutting in a lathe, but the mere action of the cutting tool assists largely to oxidise or case-harden the latter, thus giving it an unnatural surface and defeating the end in view, *i. e.*, increased ease in handling and greater malleability and coherence. In addition also this process of lead shredding by means of the lathe and the cutting tool adds very considerably to the expense, as there is a considerable amount of time taken up in moulding the lead into suitable shape for the lathe, as well as the actual time taken for adjustment and cutting.

There has, however, been placed on the market during the last few months, although the actual time of its invention dates some time back, a new process for producing shredded strip, or ribbon lead, with a perfectly natural and open surface, and without any case-hardening or closing of the pores or disturbance of the general grain of the metal. This process, to the products of which the registered trade mark "Ribbonite" has been applied, is exploited by the Ribbon Metals' Syndicate, Lim., of 50, City Road, London, E. C., with works at Island Wharf, Rainham, Essex, and, so far as could be seen during a recent

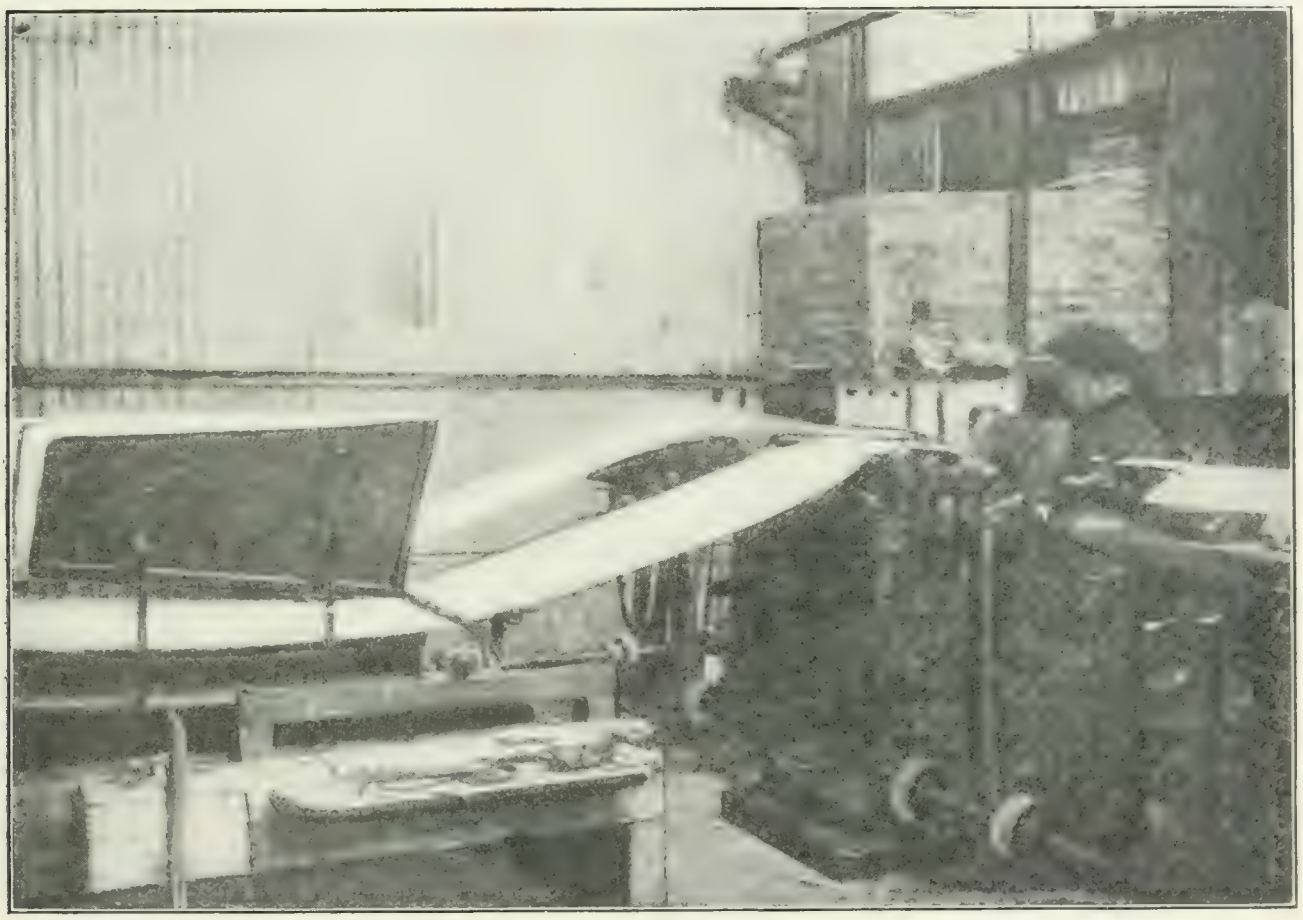


Fig. 1. Method of Making Ribbon Lead at the Works of the Ribbon Metals Syndicate, Island Wharf, Rainham, England.

*Abstract from *The Ironmongers' Chronicle & Hardwareman,* Mar. 23, 1910.

visit to the factory, promises to very largely increase the use of this "ribbon" lead in various metal working processes.

The actual process of manufacture of this "ribbon" lead is extremely simple, effective, quick, and in effect is this: The pigs of lead, after melting down, are fed into a reservoir under which are jets of gas keeping it in a molten state. In the bottom of the reservoir are placed a number of nozzles, according to the number of jets desired, and these nozzles are pierced with holes of the desired size according to the necessary width of ribbon. Immediately below these outlets is a water-cooled cylinder revolving at a high rate of speed, upon which the jets of molten lead impinge, and, by the centrifugal force exerted

Fig. 2. Ribbon or Fibrous Lead.

by the roller, are thrown off immediately in continuous strips or ribbons of lead, the operation being materially assisted by the water-cooling of the cylinder, which instantaneously cools down and solidifies the metal.

That in effect is the general system of the process. From the drum the metal is thrown off in ribbon form in more or less solid state, and falls on to a travelling canvas belt, by which it is conveyed to the end of the machine, and so into the packing boxes. The illustration we give, showing the machine in full swing, while depicting fairly clearly the general course of manufacture, hardly gives an adequate idea of the really artistic "waterfall' effect produced by the continual stream of the ribbon lead. The simplicity and rapidity of this process is best emphasised by the fact that already, with only three machines working, the company can turn out an average of well over six tons daily, or roughly about 40 tons a week, of ribbon lead. This simplicity and rapidity of manufacture, of course, tend to a comparatively low price, and the present quotation by the company for ribbon lead in quantities of not less than one ton is $25 above the market price of pig-lead; or where it is required to make a substantial test of the material, small quantities of from 14 lbs. to 56 lbs. will be supplied at the rate of $5 per cwt.

The uses to which this ribbon lead can be applied on a commercial scale are of some considerable importance. One of the chief of these is its use in the caulking of pipe joints in both water and gas pipes, instead of the cut shavings or molten lead joints now used. Cut lead, by means of the case-hardening effect of the cutting tool, will not cohere so well as ribbon lead, while with the molten lead joint the inclusion of air bubbles as well as a consequent shrinkage of the metal on the reduction of temperature causes gaps which make far from a perfect joint. That this is the case in actual facts as well as theoretically is proved by a number of tests which were recently carried out for the company by a firm of engineers. In these tests, which were comparative, the joints were subjected to varying hydraulic pressures, and in each case the ribbon lead joint came out easily on top.

Another very important use to which this ribbon lead is now being put is in connection with the white lead industry. White lead is at present prepared by the action of certain gases upon grids or plates or strips of cast lead. As the lead is converted into white lead a crust is formed on the surface which prevents the gases from acting freely on the metal underneath.

When aluminum is used in yellow brass, the amount of zinc in it can be increased nearly 50% and still have good castings.

The "Peerless" Surfacing Machines.

The "Peerless' surfacing machines, herewith illustrated, are the invention of E. J. Bein of the Peerless Surfacing Machine Co., Washington and Bank Sts., Newark, N. J. The growth of belt polishing devices began in 1896 when the foundation patent was allowed to Mr. Bein who is a pioneer in the manufacture of machines for finishing by this method. Prior to this time, all polishing by machinery was done by a disc, and some experimenting had been done by preparing canvas belts with glue and emery. This method, however, did not prove successful as it was found impossible to produce an even finish.

Mr. Bein, being a practical mechanic, saw the advantage of constructing a machine upon which emery cloth could be used, and made in endless belt form, strong enough to stand the strain over a flat table, and at the same time transmitting sufficient power to an adjustable, idle drum. After much experimenting and experience, the "Peerless" machines were constructed.

These machines, as herewith illustrated, are used for surfacing all kinds of metal articles with the production of any desired finish, even up to one highly polished. In Fig. 1 a horizontal machine is shown. This type is advantageous for many classes of work. In Fig. 2 the double belt machine is illustrated. The use of two belts on one machine is of advantage as it allows the cutting down to be done on one side and the finishing on the other when belts containing an abrasive of different degrees of fineness are used.

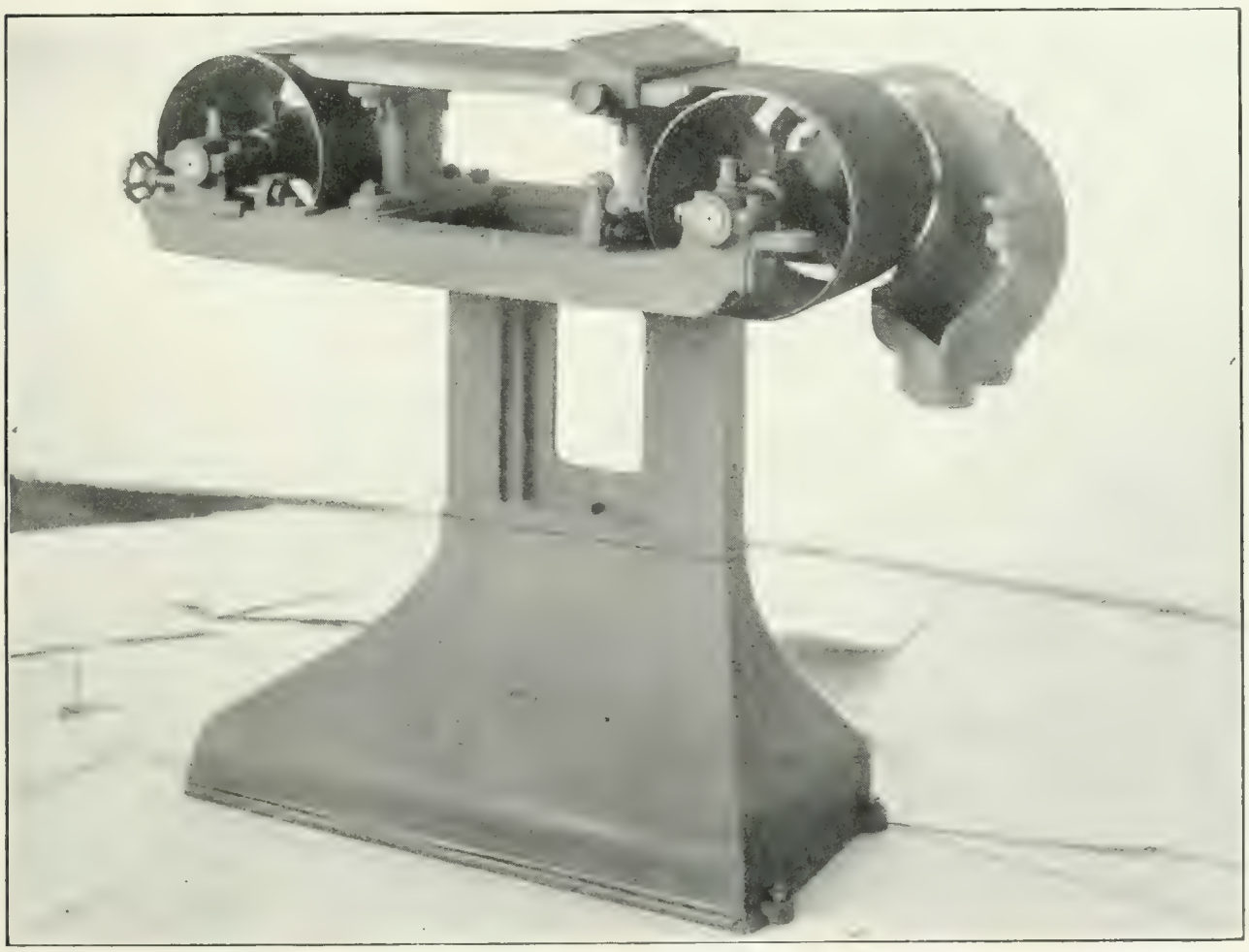


Fig. 1. The "Peerless" Horizontal Surfacing Machine.

Mr. Bein has paid particular attention to the character of the belts used on the machines. They are the result of much experience and are manufactured endless so that there will be no joint to catch in the work.

One of the features in the machines is the use of a center driving pulley and power is transmitted to the drum on one end by a leather or canvas belt, over which the abrasive belt is run, transmitting the power to the idle

drum on the rear of the machine. This gives a cushion effect to half of the machine, and

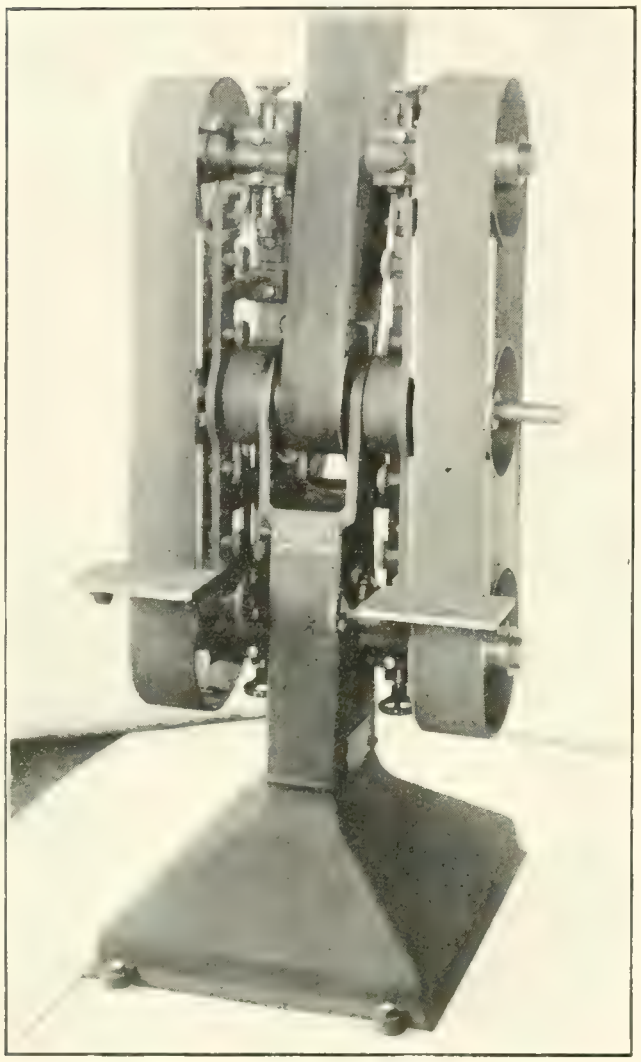


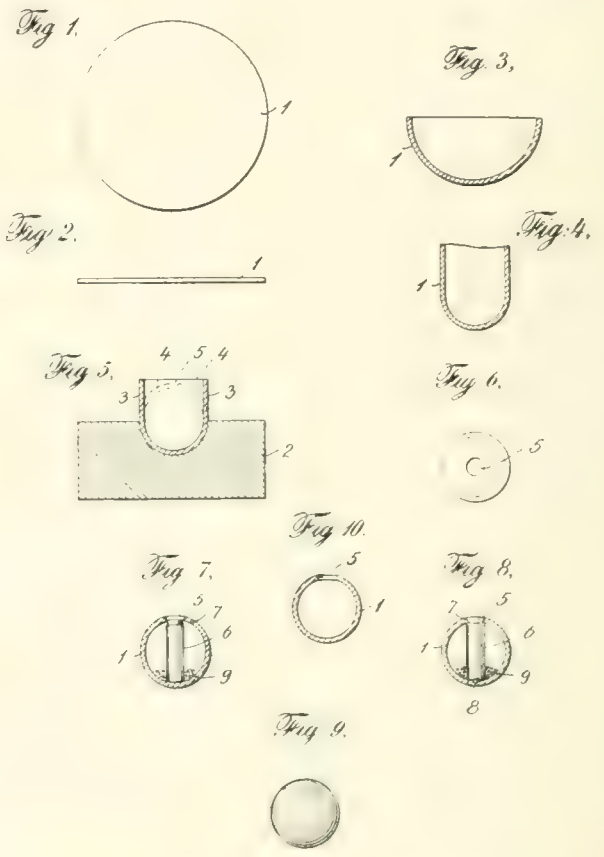
Fig. 2. The "Peerless" Two-Belt Surfacing Machine for Roughing and Finishing.

the other half travels over a platen directly under the abrasive belt making it possible to produce perfectly flat and smooth surfaces.

A Method of Making Hollow Metal Balls.

A method of making hollow sheet-metal balls has recently been patented by John W. Schatz of the Schatz Hardware Co., of Chappaqua, N. Y. (U. S. Patent 955,698, Apr. 19, 1910). The process may be understood by referring to the accompanying illustrations.

A disc made from sheet metal of the desired thickness is first punched out so that it has the appearance shown in Fig. 1 and edgewise like that in Fig. 2. The first forming operation in a press is that illustrated in Fig. 3 while a second operation causes it to have the appearance indicated in Fig. 4. After it has been trimmed to dimensions it has the shape shown in Fig. 5. The next step is to form a sphere of it under the press and to ream out the hole to size. When done it looks like Fig. 6. In Fig. 7 is shown a sectional view of the ball after a metal plug has been forced into the hole to reinforce it. This serves to stiffen the ball. The joint is now filled with galvanizing, tinning or brazing material and the whole placed in a furnace and heated so that



The Schatz Method of Making Hollow Sheet Metal Balls.

the mass will cover the surface and penetrate the joint completely. Before applying the galvanizing material the joint is swaged down in a suitable machine.

In Fig. 8 the ball is shown ready for melting the galvanizing material and in Fig. 9 a completed ball is illustrated. Fig. 10 gives a detail of special construction. The balls thus made, the inventor says, may be used as ornaments, anti-friction balls, casters, valve balls, etc., as they are lighter and cheaper than cast balls.

"Galvanit:" A New Substance for Depositing Metals by Rubbing On.

A material called "Galvanit" has recently made its appearance in England and is the invention of Augustus Rosenberg who is now placing it on the market. It is supplied in powdered form and when moistened and rubbed with a rag on the surface to be plated, a deposit of the metal forms. The principle is that of the well known process of silvering by means of a paste, but instead of silver, zinc, nickel, tin, cadmium, and other metals may be deposited. It seems to be immaterial what the metal surface is that is to be coated and this fact would appear to render it valuable for certain purposes.

The principle of the substance lies in the use of magnesium powder as the electro-positive metal and it is the base of the process. In addition, a conducting salt or electrolyte is used and a powder of the metal to be deposited. A polishing material is also used in the mixture to clean the surface of the metal to be coated and allow the whole cleaning and coating to be done in one operation.

As an example of the process, the following is the formula used for depositing zinc:

Formula for Depositing Zinc.

Zinc Dust	15	parts
Magnesium Powder	1	part
Ammonium Sulphate	5	parts
Chalk	10	parts
Soapstone	2½	parts

The zinc dust acts as the anode, the ammonium sulphate as the conducting salt, the magnesium powder as the exciting material and sets up the electric action. It was thought at one time that the use of a salt of the metal to be deposited was necessary, but it was subsequently found that the metal itself, acting as the anode, supplied a sufficient quantity. The chalk and soapstone simply act as cleaning substances to remove the film of grease or dirt when the powder is rubbed on. To use the material, it is moistened with water and rubbed on the surface with a rag, when a zinc deposit is produced.

In case a cadmium deposit is desired, the zinc powder is simply replaced by an equivalent quantity of cadmium powder, the other ingredients remaining the same. For nickel the following mixture is used:

Formula for Depositing Nickel.

Nickel Ammonium Sulphate	20	parts
Magnesium Powder	2	parts
Chalk	10	parts
Soapstone	2½	parts

The use of powdered nickel is unnecessary and the mixture is used by moistening and rubbing on with a rag.

The coatings obtained by trials of these different mixtures showed that a light coating of the metal to be deposited was readily obtained and that they will be found useful for certain purposes such as the plating of worn spots or articles which are to be refinished in the household. Nickel can be deposited upon old nickel and other metals as well, and the powders can also be used for depositing metals upon aluminum.

The inventor claims that the use of the soapstone is two-fold: First, it acts as a polishing material. Second, it prevents the absorption of moisture by the powder when in stock and before using.

Note on Soldering of Electroplating Connections.

By S. G. W.

In the wiring of electroplating tanks, a poorly soldered connection is inferior to one wound with fine wire and taped with adhesive tape, while a joint properly soldered is the most satisfactory connection known.

Heavy copper wire or rods, such as those used in carrying the heavy currents in an electroplating room, are difficult to solder with an ordinary soldering iron and soldering acid. The acid has a tendency to gum up and burn on and renders it quite difficult to make a good, solid joint. By the use of soldering paste and a gasoline torch, however, it becomes possible to heat the wire to the necessary temperature so that the solder will flow readily and "sweat" into the joint. The soldering paste is made as follows:

Take 1 oz. of muriatic acid and dissolve in it all the metallic zinc it will take up. Then stir into it one pound of vaseline (or its equivalent petrolatum) until an intimate mixture is made. This paste does not spatter when used, nor does it corrode the copper after the joint has been finished. It is also useful for many other soldering operations.

The Vitrified Grinding Wheel and How It Is Made.

By Walter C. Gold.*

In the year 1870 F. B. Norton, a flower pot manufacturer in the State of Massachusetts, conceived the idea of manufacturing an emery wheel through vitrification, using certain clays as a "bond" or binding material. The experiment was a success, and thus was born the vitrified emery wheel, which was destined to revolutionize the emery wheel business. Wheels manufactured by this process are more rapid and cool cutting; safer and more durable than wheels produced by any other method, the "bond" itself becoming a cutting property through vitrification.

Briefly stated, the method of manufacture is as follows: The grains are mixed with water and the clays which comprise the "bond". After thoroughly incorporating the grains with the "bond" (and the amount of "bond" used determines the grade or degree of hardness) the wheels are placed upon a plaster-of-Paris bat, and then placed in the dry-room, where they remain subjected to dry steam heat for from a week to ten days, the size of the wheel affecting the length of time needed to "dry out" the wheels until they assume the consistency of hard clay. They are then placed upon a potter's wheel and shaved to size and shape. After again being placed in the dry-room for a few days they are ready for the kiln. Here the wheels remain for about four days subjected to a heat reaching 2500 degrees F. After being extracted from the kiln, they are mounted on machines and turned off on sides and face; bushed with a lead hole and placed in the testing-machine, where they are speeded up to a point about 50 per cent. higher than that at which they are run in actual use. Should there be a hidden check-crack or flaw, such defect would manifest itself in the testing-machine, and the wheel burst there; but having withstood the terrific stress or strain of from six to eight thousand peripheral or surface feet per minute, it is assumed the wheels are faultless and are ready for shipment. In the vitrified process the wheels are not tamped or pressed, and after being subjected to the intense heat of the kiln, are porous and open in texture and will not, therefore, heat or burn the work. The process also renders the wheels waterproof—water and other liquids having no effect whatever—the wheels working equally well wet or dry.

Experience has proven that Naxos Emery from the Island of Naxos, Greece, is the best emery for grinding wheels. The emery is sharp and hard and is not affected by the intense heat of the kiln. The mines are controlled by the Grecian Government, and have been worked for about twenty years. Turkish emery from Asia Minor was used in emery wheel making previous to the advent of the Greek brand. No American or native emery can be used, as the kiln heat is so intense that the emery "fluxes" or melts into a shapeless mass. Turkish and American emery contain a greater percentage of oxide of iron than does the Naxos, and are now used exclusively for polishing purposes.

Corundum (which is oxide of aluminum) has been used in grinding wheels for many years. The crystals of corundum are hard and sharp, ranking next to the diamond in the scale of hardness, and produces wheels materially more rapid and cool cutting than those made from Naxos emery. The supply now comes exclusively from two deposits in the Province of Ontario, Canada. The percentages of alumina contained in these two deposits are so high that the corundum easily withstands the great heat in the kilns. Years ago, much corundum was mined in the states of North Carolina and Georgia, but these deposits became unprofitable and the mines were abandoned.

During the last fifteen years several artificial abrasives have been used extensively, the more prominent being carborundum, alundum and adamite. Carborundum is produced from a mixture consisting principally of coke, sand and sawdust treated in electrical furnaces at Niagara Falls. Many readers have no doubt seen the carborundum crystals which produce beautiful, iridescent colors.

Alundum is an artificial abrasive also manufactured at Niagara Falls through the medium of the electric current. The basis of alundum is bauxite. Alundum and adamite are practically artificial corundum. In Europe, adamite is known as electrite and is produced in Austria-Hungary.

*Philadelphia, Pa.

So indispensable have vitrified wheels become in the realm of manufacturing, that many consumers have stated that they would be low priced even if sold at *list* prices only. Their use has vastly increased during the last decade, and the prospects for the future are very promising. Wheels are now being used for an ever increasing variety of grinding, simply because the business has been placed by its pioneers upon a commercial and scientific basis. These improvements during twenty years especially may be noted: the use of the electric pyrometer, accurately indicating th heat of the kiln while in process of "burning" (before that instrument was used, the kiln-burner had to depend upon his own judgment as to when to draw the fires and allow the kiln to cool off); the use of the testing machine by the leading makers (wheels are no longer being shipped out without being tested in the especially built testing machines, and accidents are consequently very much fewer—they have been reduced to the minimum); the predetermination of grades or degree of hardness through the amount of "bond" or binding material worked into each wheel. (The more "bond" worked into a wheel, the harder it comes from the kiln and, necessarily the safer it is); the experience gained in the selection of grains and grades has enabled manufacturers to select wheels for the great and increasing variety of work with such accuracy that the number returned for every reason whatsoever is exceedingly small. The personnel of the salesman, too, has much improved—experience proving that men must have a technical knowledge of wheel manufacturing in order to successfully sell them.

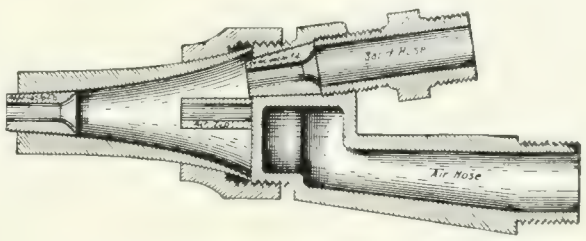
Manufacturers of to-day could hardly dispense with these "revolving files", for that is practically what they are; and it is interesting to note, in conclusion, that nearly all the grinding wheels used in Europe are manufactured in this country.

An alloy of 95% of copper and 5% of aluminum is the nearest imitation of pure gold of any of the known alloys.

Emery wheels are now beginning to be used in Sheffield, England for grinding cutlery. Heretofore, grindstones have been exclusively employed.

The Kelly High-Pressure Sand Blast.

The use of a high air pressure in sand blasting is of great advantage in certain classes of work, such as cleaning hard scale from iron or steel, treating the surface of hard steel or chilled iron, or scouring the surface of stone buildings. For cleaning the bottoms of ships it is also valuable. Heretofore, the use of a high pressure has been retarded by the absence of a suitable nozzle and it may be said also that for ordinary work, a low or medium air pressure is preferable and gives results that are satisfactory.



The Nozzle Used in the Kelly High Pressure Sand Blast.

The feature of the Kelly high-pressure sand blast lies principally in the nozzle which is herewith illustrated. It is operated by separate hose connected to the sand tank and air receiver. The sand hose takes a mixture of sand and air at low velocity, and feeds it into the high velocity jet. The sand then passes out of the ¼ inch orifice of the nozzle at high velocity. The tips which take the wear are made so that they may be readily removed and replaced by new ones.

One of the novelties of the high-pressure sand blast is the fact that moist air does not affect its working. The pressure used varies, according to the class of work to be done, from 15 to 150 lbs. per sq. in. The sand blast is manufactured by the High Pressure Sand Blast Co., 20 Broad St., New York City.

The so-called "fire" in sterling-silver is simply sub-oxide of copper *in* the surface of the metal and formed during annealing. To prevent it, the silver must be annealed in a neutral or reducing atmosphere without coming in contact with oxygen.

Hardness of the Lead Bronzes.

Some tests of the hardness of the copper, tin and lead bronzes have been made by F. Giolitti and M. Marantonio and published in *Gaz. chim. ital.* The results were obtained by testing the hardness of the cast alloys by means of the Brinell method in which a ball is pressed into the surface. A ball 10mm. in diameter was used under a pressure of 500 kilos (1100 lbs). The following are the results:

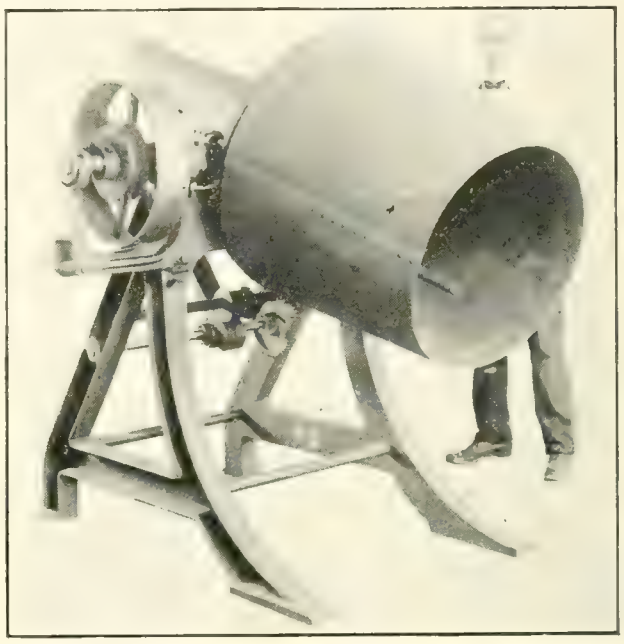
Copper	*Tin*	*Lead*	*Hardness*
95.5%	4.5%	0	49
91.2%	8.8%	0	63
83.7%	16.3%	0	77
74.1%	25.9%	0	230
91.1%	3.9%	5%	46
87.0%	8.0%	5%	61
81.2%	13.7%	5.1%	93
87.0%	2.4%	10.6%	39
81.6%	8.0%	10.4%	48
75.7%	13.9%	10.4%	86
81.8%	4.1%	14.1%	39
75.5%	9.2%	15.3%	57
75.0%	5.0%	20.0%	44
68.0%	12.0%	20.0%	70
80.0%	0	20.0%	23
60.0%	0	40.0	13

These results are of interest and will serve to indicate the variation in the hardness with the varying content of lead. While the hardness of the bronzes high in tin is great, they are too hard for use as bearings, and it has been found that those containing 10% or less are the best for such a purpose as they do not cut the axle.

Sticks of yellow phosphorus may be prevented from taking fire spontaneously by immersing them, when first taken from the tin can in which they are shipped, in a solution of sulphate of copper (blue-vitriol). This solution is made by dissolving 1 lb. of the sulphate of copper in 1 gallon of water. The phosphorus immediately becomes coated with a layer of copper. After five or ten minutes the stick of phosphorus may be removed and dried in sawdust or otherwise (without heating, of course) and can then be allowed to remain in the air for some time without danger of its taking fire.

A Large, Tilting, Oblique Tumbling Barrel.

In order to meet the demand for an oblique tumbling barrel of large size, the Baird Machine Co. of Oakville, Conn., has constructed one herewith shown and which is the largest yet built by them. It is intended to tumble castings of medium size and weight, such as valves, stove-trimmings, the larger sizes of chain and similar kinds of goods.



The New "Baird" Oblique Tumbling Barrel for Large Work.

This barrel is known as the No. 3 size and is fitted with a clutch pulley with a controlling lever handy for the operator near the tilting crank. The progress of the work can be watched without stopping the machine. The tilting mechanism is back-geared which renders the operation comparatively easy.

The barrel holds about 700 lbs. or four bushels of work and weighs about 2,000 lbs. It is intended, and for which it can be economically substituted in many instances, to replace the horizontal and closed tumbling barrel in which the progress of the work cannot be watched without stopping the machine and taking off the cover.

Many makers of silver plated flat ware are now using a bright silver solution for their work as it obviates the need of scratch-brushing and gives a bright deposit in the background of figured patterns. The deposit is also harder, but at the same time it burnishes well.

A New Machine for Making Brass Bedstead Tubing.

Large quantities of brass tubing are now used in the manufacture of brass bedsteads. Very little solid brass tubing is used for the purpose, but one consisting of a steel tube covered with a thin casing of sheet brass is employed. This tubing answers all purposes and is cheaper and stronger than solid brass tubing.

A new process of making this class of tubing has been patented by Samuel Jackson (U. S. Patent 953,955, Apr. 5, 1910.) and the method of making it is herewith illustrated.

In Fig. 1 the machine for forming the tubing is shown. A strip of brass and strip of sheet steel are fed into the machine and enter the die 15 which forms the brass over the steel by bending up the edges. The two sheets then enter the rolls 2 which force down the overlapping edge and the rolls 3 form the tube into shape.

In Fig. 2 is shown the die for forming the overlapping brass edge, the formed strip ready for passing through the forming rolls and the completed tube. After thus formed, the tube is brazed at the joint to make a solid union, but it is necessary only to cover up the seam as the tube is sufficiently strong without it.

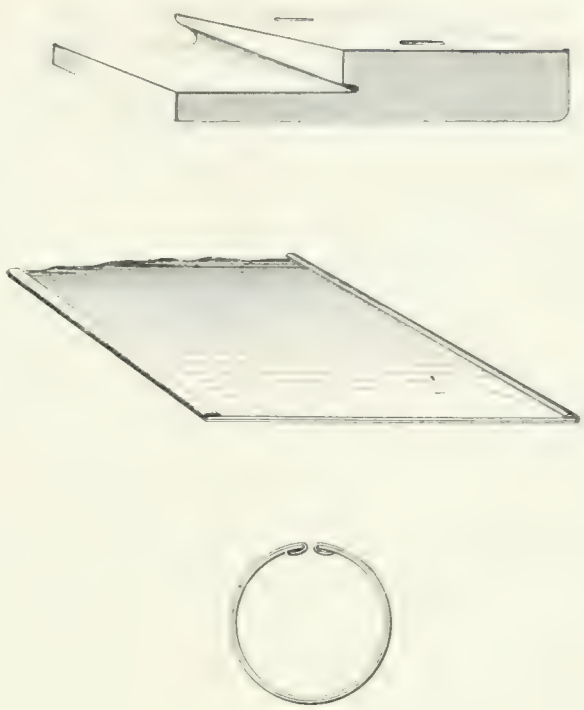


Fig. 2. The Die, the Edge of the Brass Turned over, and the Finished Tubing Ready for Brazing.

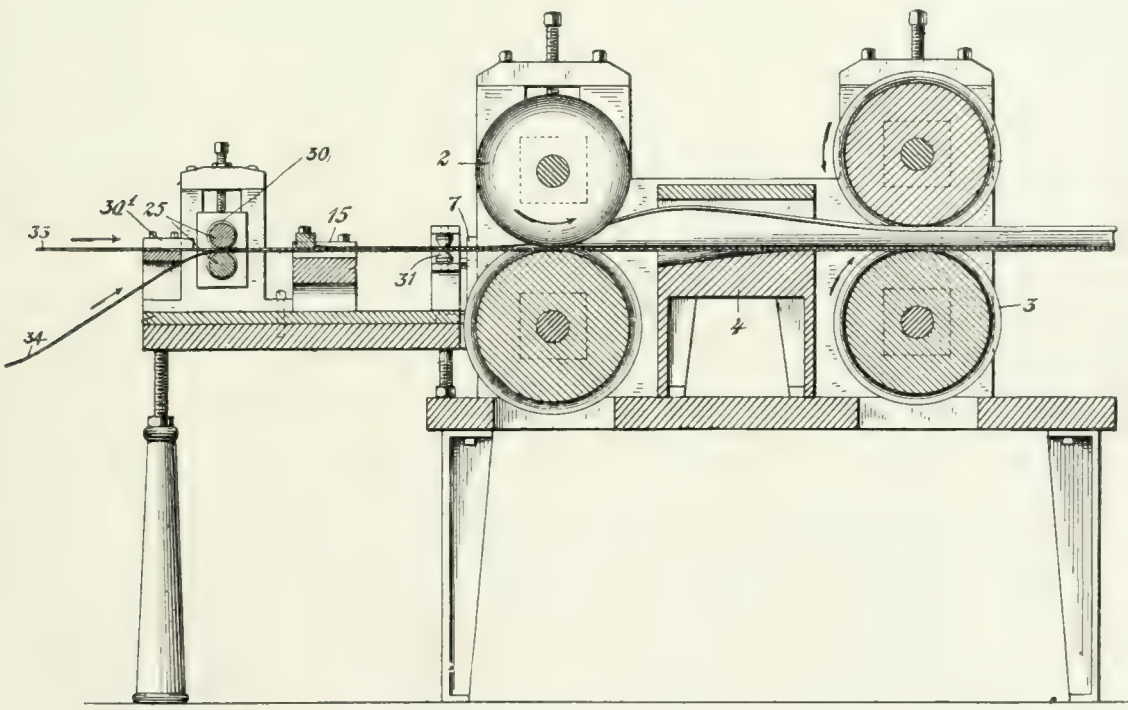


Fig. 1. Jackson's Method of Making Brass Cased Bedstead Tubing.

The strongest known substance is steel piano wire and it has a tensile strength of over 300,000 lbs. per sq. in. At the same time it will take a sharp bend and will stand twisting without breaking.

Questions and Answers.

Question No. 795. What makes a cyanide copper solution give a black or dirty deposit? When this deposit is scratch-brushed, however, it has a good color.

Answer. We should judge that your solution is an old one and it may be possible that your current is too strong so that you are "burning" the deposit. Investigate this point. If it is found that the current is not excessive, then add from 1 to 2 ounces of bi-sulphite of soda to the solution. This will serve to clear up the deposit and produce a uniform, bright color.

Question No. 796. We have heard that plaster of Paris is a good flux in melting down brass. We have never heard of its use in this direction and should hardly think it would be of any value as it will not melt, but will remain on the metal like so much sand. Is it used at all?

Answer. Plaster of Paris is an excellent flux for melting certain classes of brass and bronze and has been used for many years. Contrary to your belief, it melts easily and forms a fluid mass which has the power of dissolving earthy substances and oxides. For melting down washings, grindings and similar material it is good and is used for such a purpose. Its advantage lies in the fact that it does not attack the crucible and is cheap. When used, it may be poured out with the metal into the ingot mold as it is easily separated when the metal has cooled. The amount to use will depend upon the material you are melting. For ordinary washings, from 2 to 3 lbs. of plaster of Paris to 100 lbs. of washings will usually be sufficient and frequently more than is required. You can easily ascertain the necessary quantity to use after a few trials.

Question No. 797. In straightening iron and steel wire that has been coppered (the regular copper finish steel wire of commerce) we find that a copper deposit is left on the rolls. We have tried the use of oil, but it interferes with the plating of the wire afterwards on account of the necessity of careful cleaning. Is there anything that can be used instead of oil and which will not bother us in plating?

Answer. We suggest the use of whale-oil soap. This will act as a lubricant for your wire and will not interfere with the plating. In fact, it will assist the cleaning. Make a strong solution of it in water and use as you have the oil.

Question No. 798. Is the "Royal-Copper" finish used to any extent at the present time, and is the method of dipping the article in melted nitre the best method of producing it?

Answer. The "Royal-Copper" finish is little used at the present time, although it is one of the most beautiful of all the metal finishes. The nitre process is not as good as the lead plating process as it does not give such a deep, rich color. The article should be of solid copper or very heavily copper plated. Then give a heavy electrodeposit of lead in the usual lead plating solution, rinse, dry and heat to low redness with a gas blow-pipe. The surface is then cut down with a soft buff and rouge when the dark red color of the "Royal-Copper" will be revealed. When heated, and before cutting down, the surface is black, but the wheel will remove this color and leave the red color underneath.

Question No. 799. What kind of copper should be used for making a good grade of brass castings? Is Lake ingot copper the best for the purpose?

Answer. You will probably find Lake copper too expensive for your purpose. A good grade of electrolytic is equally as good for making sand castings and may be purchased at a less price. There is usually about a quarter of a cent a pound difference between Lake and electrolytic copper. Casting copper is still cheaper and if a good brand is selected, it will be found nearly as satisfactory as the electrolytic. Many of the brands of casting copper, however, contain considerable iron and arsenic (as well as small quantities of other impurities) which are apt to produce castings with a black skin.

Question No. 800. Can sheet nickel be spun, stamped and drawn like brass? Is there anyone in the United States making sheet nickel of this kind?

Answer. Pure, sheet nickel can be stamped, spun or drawn but not as easily as brass as it is considerably harder. It resembles steel in this respect. As far as known, there is no one in this country who manufactures a pure sheet nickel for the trade as there seems to be so little demand for it that it is usually considered it does not pay. Nearly all of it is imported from Germany and a small quantity from England.

Question No. 801. What is the best method of producing the "Snow-Flake" on brass?

Answer. A very satisfactory method is to plate the article in a cyanide copper solution with a light deposit of a few minutes duration so that it is entirely covered, and then "back" the deposit off in an acid copper solution. The "backing-off", of course, is accomplished by making the article the anode. You must bear in mind, however, that a good snow-flake cannot be produced on all kinds of brass and on rolled brass the flakes or crystals are very small. Heavy castings give the best results. The reason for the production of the snow-flakes, so called, is the bringing out or exposing of the true crystal structure.

Question No. 802. I have about fifty thousand holes to drill in brass tubing and

later will have double this number. I should like to know the most rapid method of drilling them.

Answer. Use a regular fluted steel drill (not a twist drill) made for brass and of the so-called special steel. This steel is now extensively used and there are a number of excellent brands sold. Its temper is not drawn by heating and a far greater speed and feed may be used with it, thus facilitating your work.

QUESTION No. 803. I have tried the formula for producing the "Verde Antique" by the current as given in THE BRASS WORLD, December, 1909, page 433 but without success. It always deposits brown on top of the green, and if I remove the brown by lye an uneven color is produced.

Answer. You should not use the lye solution. The deposit is always brown when it comes out of the solution. Allow to dry and then remove the brown coating with a stiff, bristle brush and the green will be left.

QUESTION No. 804. We have some old nickel anodes in the form of butt-ends, etc., which we desire to run down and cast into new anodes in our brass foundry, but have not been able to get a satisfactory melt although we have a good furnace with a blast and in which we are able to melt steel. We are using a No. 50 crucible and melt the nickel without any flux. Our brass foundry foreman says he believes a flux is required for this purpose and we desire to know if this is so and what kind of flux is suitable?

Answer. You will have to use a flux if you desire to obtain a good melt. Make a mixture as follows:

Lime	3 parts
Fluor-Spar	1 part

The lime should be weighed out, then slaked by adding a small quantity of water to it, after which it is mixed with the fluor-spar. Add about a double handful to 10 lbs. of the old anodes. It will serve to clean them and give a good melt. The slag which forms on the top may be skimmed off without difficulty by throwing a handful of dust on it to chill it.

QUESTION No. 805. Is there any metal that can be used in place of cast-iron for a galvanizing kettle which will not be attacked by the molten spelter? Our galvanizing kettle does not last long.

Answer. There is no metal which answers even as well as cast-iron, but graphite kettles are used by the American Steel & Wire Co., at Worcester, Mass., for galvanizing wire. They have been found to give good results, but the success which has followed their employment is due to the use of a bath of molten lead surrounding them so as to prevent the outside of the kettle from burning off under the effect of the fire. The use of the lead outside of the kettle has been patented, but there is none upon the use of a graphite kettle itself.

QUESTION No. 806. We have some steel scales, made of soft steel with the letters and figures on them sunken in, which we are copper plating, then oxidizing in liver of sulphur, scratch-brushing and filling the letters with white lead. The oxidized surface rubs off to some extent while we are rubbing in the white lead. We know that the copper deposit is good and that the liver of sulphur is not too strong as the surface stands the scratch-brushing. How can the difficulty be avoided?

Answer. We suggest that you give the scale a coat of thin lacquer previous to applying the white-lead as it will serve to prevent the rubbing-off of the oxidized surface. Do not use it so strong that it fills up the letters. If you use a black nickel deposit instead of the oxidized copper, we believe you will have no trouble even without lacquering. Oxidized silver will also stand better as it is a more tenacious color than oxidized copper.

QUESTION No. 807. We have just started a brass foundry and have an order for composition castings which must have a nice surface in order to be accepted. The castings we make, although we use new metal, are not satisfactory. The surface is wavy and it is usually all on the top side. The mixture we use is as follows: Copper 90 lbs.; tin 6 lbs.; lead 3 lbs.; zinc 1 lb. We have tried various ways of gating and changes in the sand without result.

Answer. Your difficulty is that you are not pouring the metal hot enough. When it is poured too cold, the surface has a wavy appearance such as you describe. We suggest adding more zinc as this will serve to overcome it also. Use 3 lbs. of zinc instead of the 1 lb. in your formula. Too little zinc will produce unsound castings.

QUESTION No. 808. Can brass bon-bon tongs be matt dipped in baskets? We have tried to dip them in this manner but they do not frost evenly and have spots on their surface.

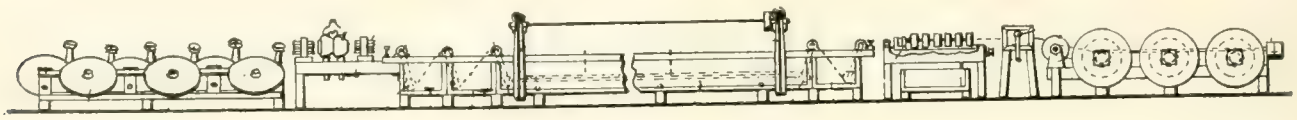
Answer. We doubt whether you will be able to do it in a basket. The tongs mass together and cannot be shaken up. Small articles, such as buttons, eyelets and similar goods can be matt dipped in a basket as they are readily shaken up, but the tongs are too large. You will have to string or rack them.

QUESTION No. 812. How should yellow brass be poured, with the flask on end or flat? We understand that some founders pour it "flat", but we have never been able to do so.

Answer. It depends upon the kind of castings you are making. Ordinary yellow brass castings that are thin, require pouring "on end" unless the brass contains aluminum, in which case they may be poured flat as the metal then runs better. It may be possible that you cannot use aluminum in your work, and if this is the case you will probably be obliged to continue pouring your work "on end." Aluminum, however, can be used in nearly all yellow brass work except that to stand pressure and not only can the work then be poured "flat" but more pieces may be put on the gate.

Patent Abstracts.

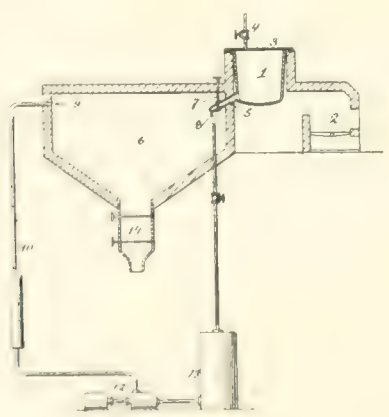
954,833, Apr. 12, 1910. WIRE-PLATING MACHINE. George L. Wallace of Bridgeport, Conn. A machine for electroplating wire and intended more particularly for electrogalvanizing iron and steel wire. The wire is first subjected to sand-blasting to clean it, then passed through an electric cleaner, then a rinsing solution and finally into the plating



bath. After this has been done, it is run through a cleaner for removing the solution on it, and finally dried and passed through a polisher. The wire is delivered in a finished state. The machine is made for six strands of wire although more can be used if additional reels are used.

954,827, Apr. 12, 1910. ELECTRIC INDUCTION FURNACE. Carl W. Soderberg of Ski, Norway. An electric furnace of the induction type for melting metals. The novelty lies in the use of disc transformers with the coils so distributed that the whole number of ampere-turns is not concentrated in one coil.

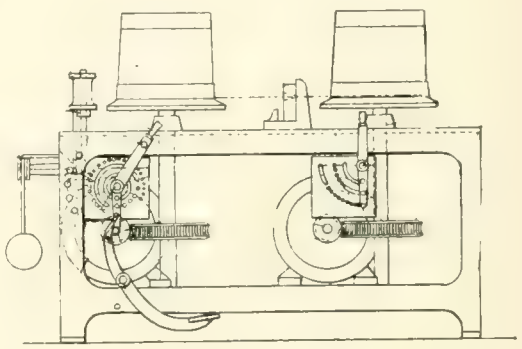
953,196, Mar. 29, 1910. PROCESS OF MAKING FILAMENTOUS LEAD. Carleton Ellis of Larchmont, N. Y. Assignor to the Ellis-Foster Co. A process of producing finely divided lead or the so-called "fibrous



lead". The method used is to force molten lead, by means of pressure, through a small orifice so that when it issues from it, air does not strike it to oxidise it, but it comes in contact with inert gases. In this manner a fibrous lead is produced which is clean and free from oxidation.

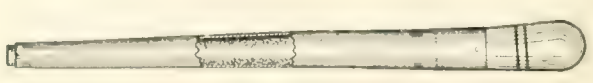
955,592, Apr. 19, 1910. PROCESS FOR COATING METAL OBJECTS. Bennard Heman of Belleville, Ill. A mixture for coating nails and spikes so that when driven into wood they will hold tenaciously. The coating material is made up of the following: Linseed oil, 20%; turpentine, 40%; aluminum powder, 20%; and micacious hematite, 20%.

954,888, Apr. 12, 1910. CONTINUOUS WIRE DRAWING MACHINERY. Harry Saville of Cleckheaton, England. Assignor to the British Steel and Wire Company of Manchester, England. The use of electric motors for driving the wire block is the es-



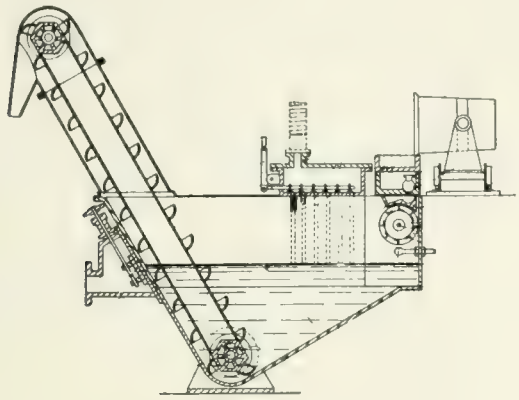
sential feature of the invention. By the use of suitable rheostats the speed of each drum may be controlled so that the variable speeds necessary in continuous wire drawing may be obtained.

953,445, Mar. 29, 1910. TOOL FOR DRESSING EMERY WHEELS. Charles H. Stephan of Dayton, Ohio. The tool is made of vitrified emery or a harder abrasive such as corundum or carborundum and baked at a high temperature to render it as hard as pos-



sible. It is then forced into the soft metal holder. The ordinary method of making such tools is to bake the vitrified material in the holder, but in this case it is done separately and inserted afterwards. The danger of melting the tube is thus avoided.

952,828, Mar. 22, 1910. APPARATUS FOR THE MANUFACTURE OF METAL GRIT. P. B. Martyn and Wm. Martyn of Airdrie, Scotland. Molten pig-iron of proper grade is poured through openings in a column in

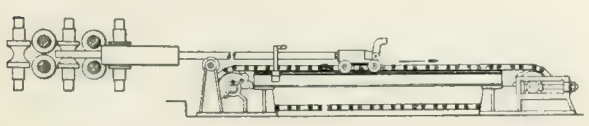


which it descends. A rotary divider then separates it into small particles after which it is dropped into water to chill it. From the water it is elevated and delivered by the endless conveyor buckets.

955,468, Apr. 19, 1910. SAND BLAST MACHINE. Chas. F. Motz of Moon Township, Pa. A machine for producing designs on the surface of glass ware by sand blasting. The principle of the sand blast is the same as ordinary types, but the novelty lies in the manner of applying it to the glass, and for exhausting the dust. A special device is used for holding the glass article.

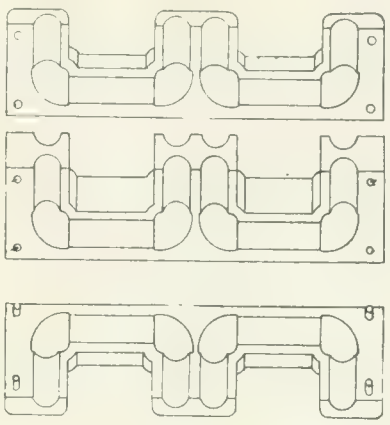
953,412, Mar. 29, 1910. ALLOY. John T. H. Dempster of Schenectady, N. Y. Assignor to the General Electric Co. of the same place. An alloy for use in electrical work and consisting of iron, 91.6%; tellurium, 2%; silicon, 6%; and manganese 0.4%. The alloy has a high resistance and is to be used for resistance work.

954,880, Apr. 12, 1910. ROLLING MILL FOR PRODUCING TUBES. Mathias Peters of Benrath, near Dusseldorf, Germany. The mill is intended for the making of seamless tubes from hollow tube-shells. The feature of it lies in the use of mechanism to extract



the mandrel while the shell passes through the rolls. The time required to make a tube is thus lessened.

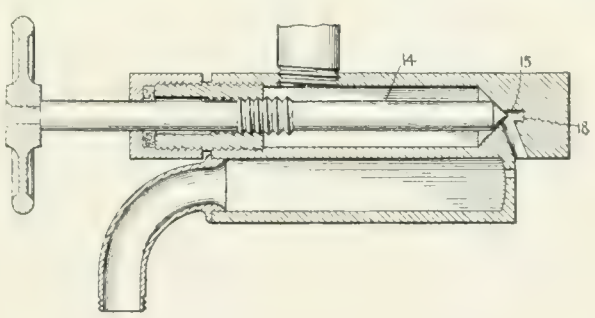
954,442, Apr. 12, 1910. CORE-BOX. John Kraus of Erie, Pa. A core box made double as illustrated. The inventor states that it



takes very little longer to ram up both sides than it does for one and the output is thus increased.

955,064, Apr. 12, 1910. BLOWPIPE FOR WELDING METAL. Patrick J. Griffin of Camden, N. J. A blowpipe for use with oxy-acetylene gas for welding metals. The novelty of the burner lies in the use of a long point so that a long flame may be obtained and of a pointed nature that the welding may be done with greater accuracy. The tip of the burner, it is claimed, does not wear out rapidly.

955,727, Apr. 19, 1910. OIL-BURNER. J. E. Walling and A. Olson of Portland, Oregon.



The oil is delivered at an opening in the burner and immediately comes in contact with a blast of air which serves to atomize and spray it in the form of mist.

955,174, Apr. 19, 1910. SAND BLAST APPARATUS. George F. Stedman of St. Louis, Mo. A sand blast more particularly designed for cleaning buildings. The object of the invention is to supply a dependable amount of sand, and also to regulate the abrading action of the blast.

Trade Items.

The Bunting Brass Co., of Alliance, Ohio, are seeking a new site. A larger plant is to be built.

The Gray-Hawley Mfg. Co., of Detroit, Mich., manufacturers of automobile accessories, are starting a brass foundry.

The Elm Mfg. Co., 391 Mulberry St., Newark, N. J., manufacturers of 10 karat jewelry has been purchased by R. C. Dick.

The new brass foundry of the Thiery & Kendrick Mfg. Co., 66 Franklin St., Detroit, Mich., has been completed.

The Fletcher White Metal Company has been incorporated in Edgewater, N. J., with a capital stock of $100,000 and will manufacture a patented white metal.

The Ohio Brass & Iron Company of Cleveland, Ohio has gone into the hands of a receiver and the court has named Irwin N. Loeser for the position.

The brass foundry plant of the Eastern Metal & Refining Co., 74 Roland St., Boston, Mass., manufacturers of brass ingots, is being enlarged.

A new material called "Platnide" is now being made into jewelry and placed on the market by the Chapin & Hollister Co., of Providence, R. I. This material is a nickel alloy and is apparently platinum plated to preserve it from tarnishing.

The Hanson & Van Winkle Company of Newark, N. J., manufacturers of electroplaters' and polishers' supplies and equipment, have opened a New York office at 79 Walker St., near Broadway in that city. A stock of supplies will be carried so that prompt deliveries can be made to the local trade.

The Edwin Lowe Gold Plate Company of Providence, R. I., one of the oldest manufacturers of rolled gold plate, has been purchased by the Improved Seamless Wire Co., of Providence, and the machinery will be moved to their plant on Eddy St. Thomas Lowe, the founder of the company preceding the Edwin Lowe Gold Plate Co., was the first to manufacture rolled gold plate in the United States having brought the secret with him from England in 1848.

The plant and business of the Fairfield Aluminum Corporation of Fairfield, Conn., aluminum founders, has been sold to the Aluminum Castings Co., of Cleveland, Ohio, who will operate it in connection with their other plants in Cleveland, Detroit, Buffalo and Syracuse. It is expected that large additions to the plant will be made in the near future and the eastern business of the company done there. The purchase of the plant was brought about by the need of an eastern plant in which the business in this section could be promptly turned out and quick deliveries made.

The Van Doren Mfg. Co., of Chicago Heights, Ill., manufacturers of steel fishing rods and similar goods, are to erect a brass foundry.

The Miller Electric Co., of Newark, N. J., dealers in platers' supplies, have changed their name to Miller & Co., and have moved to 12 William St.

The E. M. Uniack Mfg. Co., 346 Greenwich St., New York City, manufacturers of brass specialties, chandeliers, etc., are to move to New Brunswick, N. J.

The Cramer & Kiely Brass Foundry Co., has been organized in Syracuse, N. Y., and will conduct a jobbing brass foundry business. Brass, bronze and aluminum castings are to be manufactured. The foundry is located on Burnett Ave.

The new warehouse which the J. W. Paxson Co., of Philadelphia, Pa., recently established in Providence, R. I., is located at 36 Exchange Place. A complete line of foundry supplies will be carried in stock. The office is in charge of Wm. T. Nicholson.

Owing to the fact that more room was needed, the Chicago office of the Hanson & Van Winkle Company of Newark, N. J., manufacturers of electroplating supplies, has been moved from 109 North Canal St., to 108-110 North Clinton St.

The stock and machinery of the Rochelle Clock & Watch Co., of Rochelle, Ill., has been sold and is to be moved to Columbus, Ohio. It is stated that a new clock company has been organized with a capital stock of $250,000 to manufacture clocks in the factory left vacant in Rochelle.

A new material called "Ferrool Hocksit" is being placed on the market by R. F. Lang, 31 Broadway, New York City and is a hard solder for cast-iron. It is supplied in the form of paste, ready for immediate use and when applied to a broken cast-iron surface, together with borax and brazing-solder and heat applied, the joint is made firm and solid. By the use of this "Ferrool Hocksit", it is possible to repair broken machinery or other cast-iron articles without difficulty and without special appliances. A descriptive circular and instructions will be sent upon request.

Francis A. Weisbecker & Sons, 22-26 Frost St., Brooklyn, N. Y., manufacture the "Weisbecker Polishing Machine" for polishing sheet metals of all kinds. Sheet brass, copper, aluminum, tin, zinc, silver, German-silver, as well as plated sheet metal are polished in it automatically by the simple feeding of the sheets. Any desired finish may be obtained, from that which is scoured to one that is buffed to a high color. Those who have sheet metal to buff should investigate as it is a device that saves money and does not require skilled labor.

A small brass foundry has been started by the Reed & Prince Mfg. Co., of Worcester, Mass., manufacturers of screws.

A factory has been started by the Southington Mfg. Co., of Southington, Conn., for the manufacture of builders' hardware. The general manager and superintendent is M. Mohr.

The Benedict Mfg. Co., of East Syracuse, N. Y., are placing on the market a new line of art metal goods which they call "Assyrian-Gold". These goods are made in the form of jewel caskets, clocks, candlesticks and the finish is made to correspond with the name.

The Celluloid Zapon Co., Fourth Ave., and 23rd. St., New York City, with works at Stamford, Conn., are now mailing to the trade the second series of their folders illustrating the process of making lacquers. The folder will be sent to those interested and will prove of interest.

A complete foundry equipment for the U. S. Battleship *Dixie* has been furnished to the Government by the S. Obermayer Co., of Cincinnati, Ohio. A complete foundry will, therefore, be carried on the vessel so that repairs may be made at sea, not only upon the vessel itself, but upon others which may be in the fleet.

The Wire Hardware Company has been incorporated and will establish a plant at Besley Court, Chicago, Ill., for the manufacture of wire goods. The company has been organized under the laws of Massachusetts and is affiliated with the Wire Goods Co., of Worcester, Mass. The same line of goods is to be manufactured. Perry M. Shepard of Chicago is the president and Reginald Washburn of Worcester, Mass., the vice-president.

The Handel Company of Meriden, Conn., are now making a high grade of brass and bronze castings for the trade and have found that the character of the castings is such as to adapt them particularly for pattern castings. It is well known that poor castings are very expensive in metal pattern making, and the castings which they are now turning out require a simple smoothing up without the expensive filing and sizing necessary with ordinary castings. Concerns needing smooth, sound and true castings should correspond with them.

The Niagara Alkali Company of Niagara Falls, N. Y., are now the only manufacturers in the United States of electrolytic caustic potash. It is manufactured from potassium chloride which not only gives the caustic potash but also chemically pure muriatic acid. This acid they also sell in strengths of 18 to 22 degrees Beaumé. It is free from sulphur and arsenic. The caustic potash is supplied in the liquid form, from 45 to 49 per cent potassium hydroxide, and in the solid or broken state of 90 per cent equivalent. These materials are carried in stock for immediate shipment.

A new factory is to be erected by the Corry Metal Furniture Co., of Corry, Pa.

The name of the C. L. Bastian Mfg. Co., of Chicago, Ill., brass founders, has been changed to the Federal Brass. Co.

The American Roll Gold Leaf Co., has been incorporated in Providence, R. I., with a capital stock of $150,000 to manufacture gold leaf in rolls. A factory is being equipped at 236 Aborn St.

On May 1st, the general office of the Chicago Bearing Metal Company was removed from the Old Colony Building, Chicago, Ill., to the new McCormick Building, Michigan Boulevard and Van Buren St. A full line of bearing bronzes and white-metals are manufactured.

William Smith & Co., gold chain manufacturers, have moved from Providence, R. I., to Newark, N. J. They are located at 401 Mulberry St. They are one of the oldest concerns in the business having been in business in Providence for 56 years. James Wallace is the superintendent of the company.

The Waltham Watch Co., of Waltham, Mass., have begun suit in the U. S. District Court against Sears, Roebuck & Co., to enforce price contracts. The complaint alleges that movements were sold by this company at less than the contract price. Sears, Roebuck & Co., are the largest mail-order house in the United States and are located in Chicago.

The plant of the Summerill Tubing Co., now located at 114 South 2nd. St., Philadelphia, Pa., is to be moved to Bridgeport, Pa., where a new factory has been obtained. Steel, brass and copper tubing will be manufactured in small sizes and it is expected that the removal will take place in about three months.

The agreement between the Best Mfg. Co., of Pittsburgh, Pa., and the Crane Co., of Chicago, Ill., under which a new plant was to be erected at Oakmont, Pa., under the name of the Crane-Best Co., has been cancelled. The Best Mfg. Co., will complete the new plant and operate it. A new brass foundry is to be a part of the plant and it is expected that 1000 hands will be employed when it is in a finished state. Steam goods are manufactured and it is stated that the plant will be completed by August 1st.

The Bridgeport Metal Treating Co., of Bridgeport, Conn., has purchased the steel hardening business of The A. G. Barrow Co., of this city and has put in a new equipment for treating steel. Lead, cyanide and barium chloride baths have been installed together with pyrometers so that the capacity of the plant has been doubled. A specialty will be made of hardening high-speed steels, case-hardening, annealing and tool-steel hardening as well as the hardening of dies and forces. W. T. Gibson is the manager of the new company and who has had long experience in this class of work.

A branch factory is to be started at Sixth Ave. & Holgate Sts., Seattle, Washington, by the Oscar Krenz Brass & Copper Co., 212 Fremont St., San Francisco, Cal.

Theodore C. Mertz has commenced the manufacture of high grade jewelry at 8 Johnson St., Newark, N. J. A specialty is being made of platinum work.

The J. Tonkin Company has been incorporated in Camden, N. J., with a capital stock of $10,000 to carry on a jobbing plating business. The incorporators are Thos. Keogh, Robert Bastian, Jr., and G. H. B. Martin.

The W. S. Rockwell Company, manufacturers of the "Original Rockwell Furnaces", have moved into larger offices in the Hudson Terminal Building, No. 50 Church St., New York City as their increasing business necessitated additional room.

The New York office of the Ross-Tacony Crucible Co., of Philadelphia, Pa., has been moved to 1171 Fifth Ave. Building where new and commodious quarters have been obtained. This office has been placed in charge of William C. Yenger who will act as their Eastern representative and look after their interests in the New England States, New York and northern New Jersey.

Some novel and useful ovens for drying lacquers, enameling, japanning, drying cores, etc., are made by the Cullen & Atkinson Co., Ltd., of Hartford, Conn. These ovens are made so that they may be heated by either gas or gasoline. Special ovens are also made to order. They also manufacture the "Monitor Gas Mixer" which regulates and economizes the supply of gas.

G. F. Spearin, 24 Lincoln St., Somerville, Mass., is manufacturing the "Shawmut" cleaner for cleanig metal surfaces for plating. It is not intended to replace potash or other similar cleaners, but is for use in cleaning long work, such as brass tubing, which cannot be placed in the cleaning kettle. It is rubbed on the work to be cleaned and removes oil or grease and does not scratch the surface. It contains no cyanide or injurious materials and the hands are not affected. The work is cleaned in a few seconds by simple wiping. Samples will be sent to those interested.

The Bennett-O'Connell-Stevens Co., of Chicago, Ill., are headquarters for anything in the plating and polishing line. They manufacture a complete line of buffing compositions, canvas, felt and bull-neck wheels and buffs. Also a complete list of polishing and buffing lathes for every kind of use, whether in the polishing or plating room or in the brass foundry. Anodes and platers' chemicals are carried in stock for immediate shipment and 12 sizes of multipolar compound-wound dynamos ranging in size from 50 to 6000 amperes in capacity. Any size can be shipped at once. Their catalogue will be sent to those interested.

A new factory is to be erected by the S. & I. Company of Springfield, Mass., manufacturers of hardware and plumbing specialties.

The brass foundry of John Meinhart, 2129 Barnard St., Cincinnati, Ohio, has been sold to Christian Roos.

A brass foundry is to be started by the David Bradley Mfg. Co., at Hartford, Wis., and in the plant of the Hartford Plow Co., recently purchased by them.

The Victor Lamp Co., of Cincinnati, Ohio, manufacturers of vehicle lamps, have moved to their new factory at Colerain Ave., and Sassafras St., Camp Washington. The plant has been erected at a cost of $50,000.

The R. P. K. Pressed Metal Co., Howard Ave., and Spruce St., Bridgeport, Conn., manufacturers of metal shoe-trees, have installed a plating plant for doing their own work. The trees are made of sheet steel and nickel plated.

The Quick Meal Stove Co., of St. Louis, Mo., are to erect nine new buildings. A new brass foundry, 108 x 141 feet is to be built and also a new nickel plating building 99 x 101 feet. In addition, japanning and enameling shops are to be erected.

H. M. Shimer & Co., 19th. St., and Washington Ave., Philadelphia, Pa., manufacture the celebrated "Golden-Rod" spelter which is of exceptional purity. According to analyses made by their customers it averages as follows: Zinc, 99.930%; cadmium, 0.029%; iron, none; lead, none; copper, none. They also make aluminum alloys and brazing solder of all kinds.

The Brewster & Taylor Plating Company have started in business at 119 Mill St., Rochester, N. Y. A general jobbing plating business will be carried on and a specialty made of fine gold and silver plating. J. A. Brewster was formerly in charge of the plating department of the Van Bergh Silver Plate Co., of Rochester, N. Y.

The Anthony Company has been organized at 45 West 34th. St., New York City to take over, under license, the manufacture and sale of the oil burners and oil burning equipment of the American Combustion Co. The officers of the company are:—President, Nicholas W. Anthony; vice-president, A. Rowan Anthony; secretary and treasurer, Harry J. Lucas; and general manager, Charles Boone.

The Warner Silver Co., has been incorporated in Bridgeport, Conn., by Louis Weidlich, Harold .C. Weidlich and Arthur M Comley. Messrs. L. and H. C. Weidlich are of the Weidlich Bros. Co., and a short time ago bought out the Warner Silver Co., who were carrying on a job plating business. The factory is located on Cannon St., and is conducted separately from the Weidlich Bros. Co. The manufacture of electroplated novelties is carried on and a small amount of job plating.

The Magnolia Metal Co., has removed its Canadian factory and office from 31 St. Nicholas St., to 223 St. Ambrose St.

A new brass foundry is being started by the Packard Automobile Company of Detroit, Mich., for the manufacture of their own castings.

The Rockwell Furnace Co., 26 Cortlandt St., New York City are sending out their "Bulletin M" which describes their tilting, crucible melting furnaces.

The Bristol Company of Waterbury, Conn., manufacturers of the "Bristol" recording instruments and pyrometers, are sending out to the trade their Bulletin No. 124 describing the Bristol Atmospheric Recording Thermometer for outdoor temperatures with the recorder installed indoors.

The Columbus Clock Company has been incorporated in Columbus, Ohio, with a capital stock of $150,000 to manufacture clocks. The plant on Thurman St., is being equipped. The machinery has been purchased from the Rochelle Clock & Watch Co., of Rochelle, Ill., who are now out of business.

The J. D. Smith Foundry Supply Co., of Cleveland, Ohio, foundry engineers and manufacturers, call attention to the item in our April issue in regard to the equipping of the new A. B. C. Castings Co., of Cleveland, Ohio. They inform us that they supplied the equipment except the aluminum furnaces, travelling cranes, band saws, and grinders. The S. Obermayer Company of Cincinnati, Ohio also supplied a large amount of equipment as previously stated.

George W. Curtis, 666 Wythe Ave., Brooklyn, N. Y., has equipped a new factory for the manufacture of all kinds of buff wheels and has also entered into the plating and polishing supply business. Owing to his experience in the buff business, he is able to quote attractive prices and in both large and small quantities. A full line of plating and polishing supplies will be carried in stock and prompt shipments of both buffs and supplies can be made.

The "Perfection-Bronze Woven Wire Dynamo-Brush" manufactured by the Ohio Electric Specialty Mfg. Co., of Troy, Ohio, is particularly adapted for use on plating dynamos. It is made of fine gauze and is of 70 mesh. The wire is No. 34. The gauze is so woven and the brush so made that it has extreme flexibility and forms readily to any unevenness of the commutator. When formed, they are subjected to hydraulic pressure to give them density. They also make brushes of pure copper gauze. Their brushes are stocked in a large number of sizes for immediate shipment. The advantages of bronze or copper brushes on plating dynamos are well known as they have a high conductivity and carry the large amperage used. The gauze brush is far better and outwears laminated sheet metal brushes.

Henry Wray & Son, Inc., Rochester, N. Y., brass founders, are to erect a new brass foundry and machine shop at 193 Mill St., in that city.

The Fox River Screen Plate Co., of Appleton, Wis., manufacturers of screen plates for paper mills, have moved to their new factory on Lawrence St. They will later make their own brass castings.

The Central Brass Works of Kansas City, Mo., has been taken over by the Prier Bros. Brass Company of that city which recently increased its capital stock for this purpose, and it will be run in connection with the latter company.

L. O. Koven & Bro., 50 Cliff St., New York City, manufacturers of steel and galvanized tanks, are to erect a new $40,000 addition to their plant on the Paterson Plank Road, Jersey City, N. J., and which will be 80 x 195 feet. It is expected that about 70 hands will be added to their number of employees.

The Metal Dross Economy Co., of Bristol, Conn., have recently compiled a new folder describing their skimming tank for saving metal from drosses and which will be sent to anyone who may desire it. The folder describes in detail the method of using the tank and also contains a large number of testimonials of users.

The new plant of the Bayonne Casting Co., at Bayonne, N. J., is now under construction and will be equipped with all the necessary appliances for casting Monel-Metal of which a specialty is made. The foundry will be equipped with new melting furnaces, a 100 H. P. gas engine and a 20 ton crane. The plant is now located at 13 West 9th. St.

Personal.

F. R. Lund, superintendent of the Lumen Bearing Company of Buffalo, N. Y., has resigned his position with the company.

W. R. Dean of the Dean-Allen Mfg. Co., of South Portland, Maine, has severed his connection with that company and has accepted the position as superintendent of the Lumen Bearing Company of Buffalo, N. Y.

R. A. Brown is now associated with the Jonathan Bartley Crucible Company of Trenton, N. J., and is to travel in the Orient. For the past sixteen years he has represented the Joseph Dixon Crucible Co., of Jersey City, N. J.

Wm. C. Scott, chemist and metallurgist, and formerly chief chemist of the city of Sandusky, Ohio, has become associated with the Bay View Foundry Co., of that city and will have charge of the metallurgical laboratory of this company. Brass, bronze, aluminum and gray-iron castings are made and gas and gasoline engine cylinders are manufactured.

Current Metal and Supply Prices.

These Prices are net and are for moderate quantities. Smaller quantities command higher prices. Prices subject to fluctuation.

Acetone, pure, 98-99%	lb.	.22
Acid, Acetic, pure, 30%	lb.	.07
Acid, Arsenious (White Arsenic)	lb.	.20
Acid, Benzoic	lb.	.55
Acid, Boracic (Boric), pure	lb.	.12
Acid, Hydrochloric, see Acid, Muriatic.		
Acid, Hydrofluoric, 30%	lb.	.04
Acid, Hydrofluoric, 50%	lb.	.10
Acid, Muriatic, 20°	lb.	.02
Acid, Muriatic, c. p., 20°	lb.	.07
Acid, Nitric, 38°	lb.	.05⅝
Acid, Nitric, 40°	lb.	.05⅞
Acid, Nitric, 42°	lb.	.06¼
Acid, Nitric, c. p.	lb.	.08
Acid, Sulphuric, 66°	lb.	.01¾
Acid, Sulphuric, c. p.	lb.	.06
Alcohol, Wood	gal.	.50
Alcohol, Denatured	gal.	.55
Alum	lb.	.04
Aluminum, Sulphate	lb.	.06
Aluminum, Metallic, in Ingots	lb.	.23
Aqua-Fortis, see Acid, Nitric.		
Ammonia Water (Aqua-Ammonia), 20°	lb.	.04¾
Ammonia Water (Aqua-Ammonia), 26°	lb.	.06¼
Ammonia Water, c. p.	lb.	.08
Ammonium Carbonate, lump	lb.	.15
Ammonium Chloride (Sal-Ammoniac)	lb.	.12
Ammonium Hydrosulphuret	lb.	.30
Ammonium Sulphate	lb.	.07
Ammonium Suphocyanate	lb.	.50
Amyl Acetate	gal.	1.85
Antimony	lb.	.08⅜
Arsenic, Metallic	lb.	.15
Arsenic, White (Acid Arsenious)	lb.	.20
Argols, White (Cream of Tartar)	lb.	.31
Asphaltum, Commercial	lb.	.05
Asphaltum, Egyptian (Bitumen)	lb.	.30
Benzine	gal.	.15
Benzol, Pure	gal.	.75
Bismuth, Metallic	lb.	1.75
Bitumen, see Asphaltum.		
Blue-Vitriol, see Copper Sulphate.		
Borax, Crystals or Powdered	lb.	.10
Borax Glass	lb.	.35
Cadmium, Metallic	lb.	.70
Carbon Bisulphide	lb.	.10
Calcium Carbonate (Precipitated Chalk)	lb	.10
Chrome-Green	lb.	.50
Copper, Lake, (carload)	lb.	.13
Copper, Lake, (cask)	lb.	.13¼
Copper, Electrolytic, (carload)	lb.	.12½
Copper, Electrolytic, (cask)	lb.	.12¾
Copper, Casting, (carload)	lb.	.12½
Copper, Casting, (cask)	lb.	.12¾
Copper Acetate (Verdigris)	lb.	.35
Copper Carbonate, dry	lb.	.25
Copper Sulphate (Blue-Stone)	lb.	.09
Copperas, see Iron Sulphate.		
Corrosive Sublimate, see Mercury Bichloride.		
Cream-Tartar, see Potassium Bitartarate.		
Cryolite	lb.	.12
Cyanide, see Potassium Cyanide.		
Dextrin	lb.	.15
Emery Flour	lb.	.04
Emery, F F & F F F	lb.	.03
Flint, powdered	lb.	.01
Fluor-Spar	lb.	.01¼
Fusel-Oil	gal.	1.75
Gold Chloride	dwt.	.60
Gum Copal	lb.	.30
Gum Guiacum	lb.	.26
Gum Mastic	lb.	.70
Gum Sandarac	lb.	.35
Gum Shellac, brown	lb.	.50
Gum Shellac, white	lb.	.60
Iron Perchloride	lb.	.25
Iron Sulphate (Copperas)	lb.	.05
Lead Acetate (Sugar of Lead)	lb.	.15
Lead, Pig	lb.	.04½
Lead, Red	lb.	.12
Lead, Yellow Oxide (Litharge)	lb.	.12
Liver of Sulphur, see Potassium Sulphide.		
Manganese, Ferro, 80%	lb.	.10
Manganese, Metallic, pure	lb.	.75
Magnesium, Metallic	lb.	1.50
Mercury Bichloride (Corrosive Sublimate)	lb.	.93
Mercury, Metallic (Quicksilver)	lb.	.50
Mercury Nitrate	lb.	1.50
Mercury Oxide, yellow	lb.	1.80
Nickel and Ammonium Sulphate (Double Salts)	lb.	.16
Nickel Carbonate, dry	lb.	.60
Nickel Chloride	lb.	.50
Nickel Metallic	lb.	.49
Nickel Sulphate (Single Salts)	lb.	.25
Nitre (Saltpetre), see Potassium Nitrate.		
Oil of Vitriol, see Acid, Sulphuric.		
Paraffine	lb.	.15
Phosphorus, yellow	lb.	.40
Phosphorus, red	lb.	1.10
Pitch	lb.	.05
Plaster of Paris, Dental	bbl.	4.00
Platinum Chloride	oz.	14.50
Platinum Metallic	oz.	29.00
Potash-by-Alcohol, in sticks	lb.	.50
Potash, Caustic (Potassium Hydrate)	lb.	.08
Potassium Bichromate	lb.	.14
Potassium Bitartarate (Cream of Tartar)	lb.	.31
Potassium Carbonate (Pearlash)	lb.	.10
Potassium Chlorate	lb.	.15
Potassium Cyanide	lb.	.25
Potassium Iodide	lb.	2.25
Potassium Nitrate (Nitre or Saltpetre)	lb.	.10
Potassium Permanganate	lb.	.17
Potassium, Red Prussiate	lb.	.60
Potassium, Yellow Prussiate	lb.	.24
Potassium Sulphide (Liver of Sulphur)	lb.	.15
Potassium Sulphuret, see Potassium Sulphide.		
Potassium Sulphocyanate	lb.	.70
Pumice, Ground	lb.	.05
Quartz, Powdered	lb.	.01
Rosin, Yellow	lb.	.04
Sal-Ammoniac, see Ammonium Chloride.		
Sal-Soda, see Sodium Carbonate.		
Silver Chloride, dry	oz.	.75
Silver Cyanide	oz.	1.00
Silver, Fine	oz.	.51⅛
Silver Nitrate, crystals	oz.	.50
Soda-Ash	lb.	.05
Sodium Biborate, see Borax.		
Sodium Bisulphite	lb.	.15
Sodium Carbonate (Sal-Soda), crystals	lb.	.02
Sodium Hydrate (Caustic Soda)	lb.	.05
Sodium Hydrate (Caustic Soda) by Alcohol (in sticks)	lb.	.45
Sodium Hyposulphite ("Hypo")	lb.	.04
Sodium Metallic	lb.	.90
Sodium Nitrate	lb.	.05
Sodium Phosphate	lb.	.09
Sodium Silicate (Water-Glass)	lb.	.04
Soot, Calcined	lb.	.15
Spelter, see Zinc.		
Sugar of Lead, see Lead Acetate.		
Sulphur (Brimstone) in lump	lb.	.05
Tin Chloride	lb.	.43
Tin, Metallic	lb.	.32¾
Turpentine, Venice	lb.	.35
Verdigris, see Copper Acetate.		
Water, Distilled	gal.	.15
Water-Glass, see Sodium Silicate.		
Wax, Beeswax, yellow	lb.	.45
Wax, Carnauba	lb.	.70
Whiting (Ground Chalk)	lb.	.02
Zinc Carbonate, dry	lb.	.19
Zinc Chloride	lb.	,12
Zinc, Sulphate	lb.	.06
Zinc, (spelter)	lb.	.05⅛

THE

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Briquetting Metal Chips.

Much hue and cry is being made about a process discovered in Germany for briquetting metal chips, filings or turnings for preparing them for melting. It is stated that the loss in melting is then greatly reduced. The process is claimed to be new.

As a matter of fact this process has been in use in the brass rolling mill industry for many years and is being carried on every day. In this trade it is known as "cabbaging". At the beginning of the business, and until some ten or fifteen years ago, hand cabbaging was carried on, but the so-called hydraulic cabbaging machine then made its appearance and has supplanted to a large extent the hand cabbaging process.

The method of using the hand cabbaging machine is the same as that used in the briquetting process in Germany. The material is placed in the hopper and the plunger forces the metal down into a hard, compact mass. The result is a solid mass of metal that is not exposed to the air or gases in melting to the extent it would be in the loose condition.

At the present time, brass rolling mills confine their cabbaging operations principally to the cabbaging of sheet scrap and wire. Owing to the fact that hard materials, such as hard-drawn wire, hard-rolled sheet or chips must be annealed before they can be cabbaged, it adds extra expense to the cabbaging of chips from the overhauling machine. Were the chips, as they come from the machine and

which are hard and springy, compressed in the machine, they would not pack into a compact mass. Although few concerns now cabbage their overhauling chips, it is believed that it would pay as the loss in melting would then be less and the metal made by melting them would be better.

Cyanide of Silver in Making up Silver Plating Solutions.

Although the majority of silver ware manufacturers in the United States who carry on silver plating, use chloride of silver in making up their silver plating solutions, the indications point to the fact that it is only a matter of time, perhaps, when it will be abandoned and cyanide of silver used in its place.

As far as the actual character of the silver deposit is concerned, it has never been shown that the cyanide of silver gives any better deposit than the chloride, but its advantage lies in other directions. In the first place, it is theoretically correct while the chloride is not. When chloride of silver is dissolved in potassium cyanide, silver cyanide and potassium chloride are formed by the interchange of radicals. The potassium chloride is an inert salt and simply fills the solution with useless material. A plating bath made with the chloride of silver will not last as long, before it becomes useless, as one which is made from the cyanide of silver.

The other objection to the use of chloride of silver is that chlorine is given off at the anode to a slight extent. Its only effect, however, seems to be that it attacks the iron hooks and anode rods (when the latter is immersed in the solution) and corrodes them after a time so that a poor connection results. With cyanide of silver this does not take place. In the case of the chloride of silver, the action is slight, but in time it is quite manifest.

For ordinary work, it is hardly advisable for platers who are using the chloride of silver to give it up for the cyanide. The chloride is so easily made, that it offers an inducement to use it. For the finest classes of work, however, it would seem that the cyanide of silver offers advantages that will repay for the trouble in making it. In England and Germany it is extensively employed, and some large concerns in the United States use it, but the majority use the chloride because it is more easily prepared.

Producing Polished Nickel Plated Work in the Plating Barrel.

In nickel plating work in the plating barrel, in which the goods are tumbled in the same manner as in a tumbling barrel, the surface fails to come out with the polished nickel that is desired. There is usually a slight film or tarnish upon it that does not give the goods the appearance desired. When the nickel solution is properly made and contains boracic acid, this stain is not as pronounced as it is from a solution that is not in good condition; but even under the best of such conditions the deposit is not as bright as desired.

One concern engaged in the manufacture of small metal goods and which operates plating barrels for nickel plating the work, has found that if small pieces of felt or canvas are placed in the barrel with the work and tumbled with it during the plating, the surface of the nickel plated goods will be well polished after the plating operation has been completed. The felt simply buffs the surface of the work while it is being plated and it is then delivered from the barrel with a much better surface than when no felt is used.

The reason for using the felt is that it is soft and will not scratch the work. Canvas will answer but it is not quite as good as the felt.

Some Recent Determinations of the Melting Points of Metals.

In a German periodical, H. Von Wartenberg has determined the melting points of some rare metals. The temperature was measured by a Wanner pyrometer. The following melting points were thus obtained:

Vanadium	1710° C. = 3110° F.
Rhodium	1970° C. = 3578° F.
Iridium	2360° C. = 4280° F.
Molybdenum	over 2550° C. = 4622° F.
Tungsten	2900° C. = 5252° F.

The metals were as pure as possible. It is stated that the vanadium used was of 97% purity.

Making Re-Melted Spelter from Sheet Zinc Scrap, Zinc Routings, Battery Zincs, Engravers' Zinc, Etc.

As more zinc is now used than ever before, the quantity of scrap which finds its way into the market is correspondingly large. Scrap zinc is found on the market in two forms:

1. Zinc dross, skimmings and ashes.
2. The various forms of sheet zinc scrap or material that is a by-product of sheet zinc. Battery zinc also comes under this head.

Zinc dross, skimmings and ashes cannot be used for making good spelter without special treatment to remove the foreign matter like iron, and as it cannot be used by simply melting it and pouring into slabs the same as sheet zinc scrap, ordinary scrap smelters are unable to use it. Its treatment, therefore, does not concern us now. It is the various forms of zinc found on the market in such a shape and condition that simple remelting and pouring into slabs will give good spelter, that will be taken up and described.

Sheet Zinc Scrap

A very large variety of sheet zinc scrap is found in the market. As sheet zinc is always made from good spelter or it could not be rolled, the scrap is likewise good unless contaminated with foreign matter. The best kind of sheet zinc scrap that can be found are new sheet clippings. They are usually obtained in small lots from tinsmiths and roofers who use sheet zinc for various purposes. Other manufacturers, such as makers of refrigerators, wash-boards and stove-boards also produce it. Any user of sheet zinc is certain to have more or less sheet clippings. When it can be ob-

Iron Kettle Used for Melting the Zinc Scrap of all Kinds.

tained it is an excellent material as it is clean and free from solder or other foreign matter. Among the large producers of sheet zinc scrap are the manufacturers of fruit jar tops and oil-cans who use large quantities of sheet zinc. Zinc eyelet manufacturers and shoe tip makers are also heavy producers of scrap.

Old sheet zinc that has been exposed to the weather is not as good as new sheet clippings for the reason that it is badly oxidized and usually covered with dirt. It frequently contains solder too, which renders it less valuable, although the solder is generally present in so small an amount that the slab spelter is not injured for brass foundry use. Among the principal kinds of old sheet zinc may be mentioned old wash-boards, stove-boards, refrigerator linings, fruit jar-tops, old roofing and gutters, and other similar articles although in less quantities. Most of the scrap finds its way to the dump, from which it is reclaimed by junkers and allowed to accumulate until of sufficient quantity to sell. It is usually quite badly corroded and is always dirty.

Engravers' Zinc

Large quantities of sheet zinc are used by photo-engravers in making cuts for printing. The zinc is covered with an enamel, the photograph printed on it and then, after special treatment, the photograph is brought out by etching with dilute nitric acid. These cuts are used for printing of all kinds, and usually are thrown away after they have been used once. They are mounted on a wood block when used and from which they are removed by junkers or scrap metal men who obtain them. Like the sheet zinc clippings they are "preferred stock" as the only contamination is a little printers' ink which burns off in the melting. These zinc engravers' plates are equally as pure as the zinc clippings obtained from other sources. Engravers' plates are thicker than ordinary sheet zinc and melt with less waste. When melted they make first class spelter.

Rolled zinc as found on the American market has about the following composition:

Zinc	99.45%
Lead	0.50%
Iron	0.05%

The amount of lead and iron are sufficiently low to allow the zinc to roll. If they are much more than the above quantities it will not roll well. Most of the zinc in sheet form comes from the West and when in slabs for brass founders' use, is known as "Prime Western". There are a few zinc rolling mills in the East, but they confine their operations to the manufacturers of thin sheet zinc for making eyelets, etc. It will be seen, therefore, that sheet zinc scrap is really quite pure and compares very favorably with the average spelter used in the brass foundry and brass rolling mill. For brass foundry use it is pure enough for practically every purpose.

Zinc Routings

In the manufacture of zinc plates for printing, or the so-called zinc cuts or etchings, certain portions are cut out by means of a routing machine which produces a very fine shaving. These shavings are known as "zinc routings" and every photo-engraver makes them. They are very bulky, but are as pure as the sheet zinc scrap, provided they are kept free from electrotype routings which are composed of lead, tin and antimony. As the majority of photo-engravers make electrotypes, it is difficult to keep the two metals separate and zinc routings,, therefore, are usually contaminated to a greater or less extent with electrotype metal routings. This material injures them.

Zinc sawings and coarse chips are also produced in small lots by manufacturers to make zinc castings for clocks and similar ornamental work, but are quite an insignificant portion of the zinc scrap supply.

Melting the Zinc

Even though the sheet zinc scrap may be of the best grade, such as new sheet clippings or engravers' zinc, it is always unwise to attempt to use it in brass making without first re-melting and pouring into slabs, on account the uncertainty of the quantity that enters the metal and the great amount of waste. When in slab form the results are positive and uniform.

Zinc scrap is melted in an iron kettle such as that shown in the illustration. The kettle may be large or small as desired although a large one will be found the most serviceable. One holding a ton of zinc is frequently used although it really will not make much difference whether it is as large as this except that more labor is involved.

The first thing to do with the scrap is to hand pick it and remove all iron, brass, wood,

rags and other foreign matter. In case there is much solder it is usually advisable to cut off the portions containing it, although small quantities will not affect the spelter to any appreciable extent. The zinc should be *dry*. This is an important matter as wet scrap put into the kettle will not only endanger the workmen, but will result in a loss of zinc by spattering. It is a simple matter to dry the zinc and it is accomplished by storing it in a dry place. If left out in a shed or where water can get to it, it will hold it for some time.

To begin melting, the kettle is about half filled with heavy zinc. Do not add the sheet zinc or the routings yet or the loss will be heavy. The best method of procedure is to allow a portion of the zinc from the previous day's melting to remain in the kettle. The fire is started and the zinc melted. When it has arrived at a good heat, the sheet zinc scrap is taken in tongs and *immediately pushed down under the surface.* It is at once dissolved. The routings are treated in the same manner and it must be borne in mind that the bath of zinc is used to dissolve the scrap and it then does not come in contact with the air. Were it to be melted alone by placing it in a kettle and allowing it to melt the same as heavier zinc, the loss would be high. By dissolving it, so to speak, in the bath of molten zinc, there is very little waste. In order to demonstrate this point the following experiment was made:

Zinc routings were obtained free from electrotype scrap and were melted by taking a bath of molten zinc and then pushing the routings down under the surface as quickly as possible. The following results were obtained:

Weight of Metal in Kettle ..	405 lbs.
Weight of Routings Used ...	40 lbs.
Total Weight	445 lbs.
Weight of Metal Obtained ..	420 lbs.
Loss	25 lbs. = 5.6%

Chips or routings frequently contain oil or grease, and those used in the above experiment were slightly oily, so that when dry and clean chips are obtained the loss probably can be kept down much lower.

Battery Zinc

Battery zinc is still one of the regular supplies of scrap zinc although zinc batteries are used to a much less extent than formerly. It is usually an inferior grade of zinc, although some makers of batteries use a refined zinc in them. The zinc from ordinary sal-ammoniac batteries or similar kinds, is usually a poor grade.

Battery zinc are usually covered with a thick, hard crust, the result of corrosion and this crust is all waste. Then too the zincs may have solder on them and brass or copper wire, screws or rivets attached to them. These are left on as it takes too much time to remove them and does not pay. The zinc is melted just as received. What foreign matter is on them is skimmed off after the melting is done.

Battery zincs also contain mercury as this metal is used for amalgamating the surface and preventing local action while the battery is not in use. When melted, some of the mercury goes off and some stays in the zinc. The presence of a small quantity of mercury, however, has not been found to injure the zinc appreciably, nor can it be detected, after the zinc has been melted, except by analysis. When the mercury is present to a considerable amount it makes the zinc brittle.

As a usual thing, battery zinc is the poorest material found in the scrap market. If good spelter is to be made, it is well to avoid using too much in the kettle, but, if possible, to add a certain percentage, say 25%, to the melted sheet spelter.

Treating the Zinc When Melted

When all the scrap has been melted according to the preceding directions, it will be found that the top of the metal is covered with a thick mass or dross and other foreign matter. This is caused partially by the oxidation of the zinc during the melting and partially by foreign matter, such as dirt and similar material on the zinc before melting.

When melted, or at such times during the melting operation as may be necessary, take a ladle and skim off the dross. One bored full of holes so as to make a strainer will be found satisfactory as it allows the clean metal to pass through the holes and the dross and dirt will be retained in the ladle.

When the mass of foreign matter has been skimmed off, take a handful of sal-ammoniac

and throw on the surface of the zinc in the kettle. Then stir vigorously. It will clean the surface of the zinc and collect the oxide and impurities in a mass so that they can be removed. Thus will a clean zinc surface be left.

The zinc can now be ladled out into molds, but it should be borne in mind that the lower the heat in casting it the better the surface of the slab. When too hot it will be dirty and the metal in the kettle should be cooled down from time to time whenever necessary.

By the use of selected scrap zinc and as free from solder and lead as possible, it is possible to make a re-melted spelter that is quite satisfactory for brass founders use and which is much cheaper than new slab spelter. For brass rolling mill use it is not satisfactory, however, as the presence of small amounts of tin in it (coming from solder on the scrap zinc) will injure it for such work.

There is one thing that must now be carefully looked after in making remelted spelter and that is the presence of aluminum in the scrap. There is so much aluminum now used that it finds its way into the zinc scrap on account of its color. It is readily distinguished, however, and should be carefully removed before melting the spelter. It will pay to do this too for the aluminum is worth much more than the zinc.

The question is often raised, whether the addition of a small amount of aluminum in the spelter is not an advantage. Those who make slab spelter from zinc dross use it and it would naturally seem that it could be used in making slab spelter from remelted sheet scrap, etc. The answer is: *If you desire to keep your trade and obtain a reputation for making good, remelted spelter, don't do it!* While aluminum makes the zinc run freely, and will prevent its thickening, the presence of even a small amount will injure most of the work which the average brass founder makes. Aluminum in composition or bronze is injurious, and in many kinds of yellow brass it is objectionable. To be sure, it is advantageous in making yellow brass castings of some kinds, but the brass founder wants to add the aluminum himself when necessary and leave it out when not, so that he wishes a spelter that contains none. It will readily be appreciated, therefore, that aluminum should not be added to the spelter in melting scrap for making it, neither should any aluminum scrap be allowed to contaminate the scrap zinc, but should be carefully picked out.

When these instructions are carefully carried out, it will be found possible to make a fine grade of slab spelter, free from aluminum and of a quality that will compare very favorably with new material or the so-called "Prime-Western" article.

Zirconia Crucibles.

According to R. Bayer in *Zeit. Angew. Chem.* 1910, pages 485-488, zirconia is an excellent material for crucibles for melting metals. He has made the crucibles in the following manner:

Zirconium hydroxide was obtained by precipitation and pressing through a filter-press. A small amount of starch was added to hold the crucible in shape while drying. The mass thus obtained was molded in the form of a crucible in a press, then air dried, next heated gently for some time and finally to a temperature of from 2000-2300 degrees C. in a Hempel electric furnace. The crucible thus obtained was fairly strong, resisted chemical reagents well and was extremely indifferent to sudden changes of temperature. The hot crucible could be plunged into water without cracking it. It is stated that zirconia is the only suitable insulating substance for the electric current at temperatures ranging about 2000 degrees C.

At the present time, zirconia can be used only for small crucibles for experimental or laboratory purposes. It is one of the rare earths, and even were it proved that it would be possible to use it for large crucibles, its expense would prohibit it.

The good quality of Lake Superior copper for making brass for rolling lies in the presence of a small amount of arsenic which acts as a deoxidizing agent.

Babbitt-metal, solder or other soft-metal molds are preferably made of cast-iron. While bronze molds are more easily made and a smoother surface can be obtained, there is danger of the hot metal adhering to the bronze unless constant care is taken to keep them cooled down. Cast-iron also holds its shape better during the pounding often necessary to release the cast bars of metal.

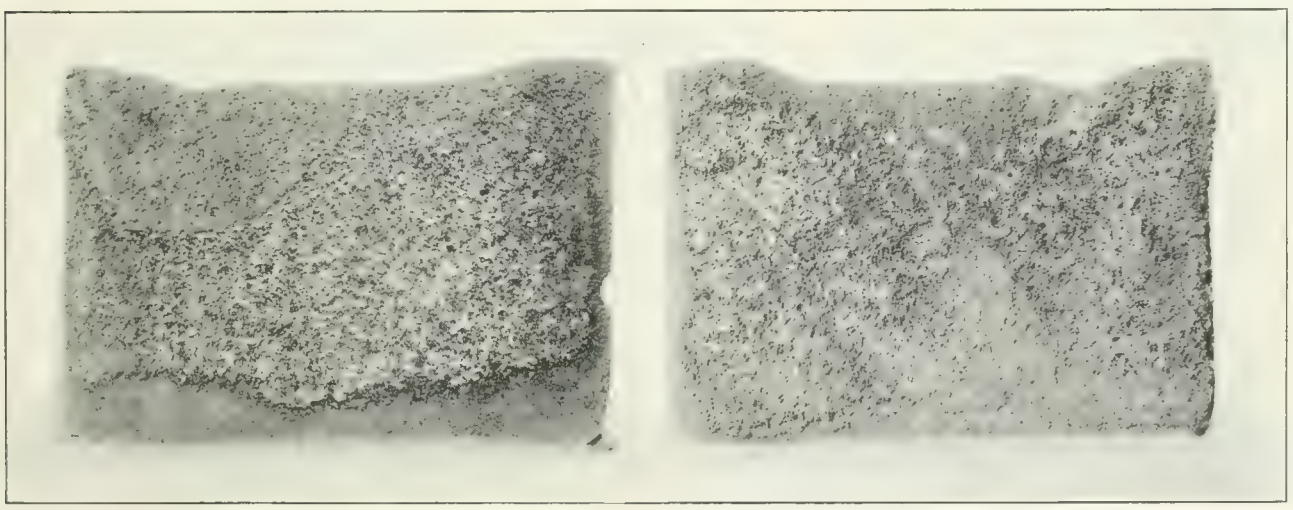
Granular Nickel Anodes.

Nickel platers now and then find that their nickel anodes are becoming granular so that when cleaned, instead of the soft mud that is found on the surface, a coarse, granular material comes off like so much sand. Under such conditions much of the anode is lost as the sandy substance is nickel.

The difficulty seems to take place with all makes of anodes, and inquiry has developed the fact that all the nickel anode manufacturers to have it to contend with regularly. It is this fact that leads one to believe the fault is with the solution and not the anodes themscelves. The cause of the granular anodes usually has been a matter of doubt, and as it is one of the things which does not happen very frequently, it has gone along without solution.

solution was allowed to evaporate until the double salts began to crystallize out it was found that the anodes came granular. In this instance the plater was the slovenly kind and crystals of nickel salts an inch thick were around the top of his tank. Another case in which the solution stood at 8 degrees was noticed. It was enriched by the use of double and single salts until it stood at 10 degrees and no water was added. The salts were simply dissolved in the solution. The anodes began to come granular after a time.

The appearance of granular anodes is shown in the illustration. The front and back side of the bottom portion of one of the anodes in the tank of the concern which was first mentioned is shown. The bottom was broken off for this purpose. When the hand is rubbed over it, a large quantity of sandy material comes off. It is not mud, but granular nickel.



The Back and Front of a Nickel Anode, Which Became Granular in a Nickel Solution too Dense.

A number of instances have recently come up in which it is quite certain that the cause of granular nickel anodes is the use of too strong a solution. One case was that of a concern plating small metal goods in a still solution and which was used so strong that it would not take up any more double salts. It stood over 10 degrees Beaumé. They previously had allowed the solution to stand at 7 degrees and it ran without trouble. It was then, upon the advice of "somebody", increased in density until it stood over 10 degrees. The result was the granular nickel anodes. When diluted with water until it was brought back to 7 degrees, the granular difficulty ceased.

In another instance in which the nickel

The explanation of the influence of saturated or too strong nickel solutions upon the nickel anodes which results in the granular condition is that, owing to the fact the solution is saturated, it will not take up the basic salts which are formed at the anode. A crystallized deposit seems to form on the anode as an inspection of the anode herewith illustrated shows, and this appeared to prevent the even action of the current.

The remedy seems to be that a weaker solution should be used. In the cases which have come to hand, the addition of water to reduce the excessive strength of the solution has always resulted in satisfactory work being obtained and without the formation of granular nickel anodes.

Brass Melting in the Induction Furnace.

In a paper presented at the Pittsburgh meeting of the American Electrochemical Society held from May 5th to 7th, T. Rowlands discussed the current practice with the electric induction furnace and described its use in the melting of metals.

Among the data given in regard to steel melting, for which the furnace is now exclusively used as a commercial proposition, the fact was mentioned that William Jessop & Sons, of Sheffield, England, the large and celebrated tool-steel manufacturers, have installed a furnace for steel melting with a capacity of 8 or 10 tons per day. In regard to nickel melting, experiments were tried at Niagara Falls working with a 60 kw. furnace. The furnace was lined with magnesite. The nickel was melted without difficulty but the product was not particularly satisfactory on account of technical and commercial difficulties which, the author claimed, could be overcome in future work. In regard to the melting of brass the following remarks were made:

"Very little work has been carried out in this country on brass and bronze, and on that account, the information obtained is from England. The Grondal-Kjellin Company, Limited, 20 Abchurch Lane, London, E. C., worked on brass, and, when the ordinary furnace was used, were troubled with the "pinch effect", so well known to you all, through the constant reference to it by Mr. Carl Hering, who has made a study of the phenomenon. They overcame the difficulty by using a special crucible, together with a specially constructed coil on the furnace, whereby the electrical conditions could be so changed that at any desired moment most of the current could be carried either by the metal in the bath or by the crucible itself. By this arrangement the crucible is first heated, and, when sufficiently hot, the brass scrap is charged. This soon melts, completing a circuit. The switch is then thrown over, and the metal itself carries most of the current; the crucible, when exposed, gradually becomes cooler, the cooling being visible.

After the first melt was obtained, 112 pounds of brass were charged and melted in about 30 minutes, with a power supply of about 30 kw., and twice the quantity only required 50 kw., melting in the same time. The first heating of the crucible required 42 kw. hours, and took 1½ hours.

The brass produced was remarkably sound, and, when tested against that produced in the ordinary way, showed excellent results.

In addition to this work, other experiments have been carried out on a 3-phase furnace, the lining being of firebrick. The result of these experiments shows a power consumption of 18 kw. hours per 100 kgs., or about 185 kw. hours per gross ton.

The "pinch" effect is far less intense in the use of 3-phase current as compared with single-phase.

As this work is still being carried out, it is not possible to give final results at the present moment."

Nickel Lithographic Plates.

For the production of lithographic plates for printing, a very fine grain stone imported from Germany is used. It is a variety of limestone and it is in almost universal use. Owing to its cost and weight in large sizes, however, substitutes have always been sought. At one time it seemed as if aluminum was bound to replace it, but it was found wanting and is now used for some classes of cheap work or for large plates where stone would be quite expensive. Sheet zinc is also used.

A process recently invented by William Gerb of Berlin, Germany allows the use of electrodeposited nickel for the purpose. The method of producing it is as follows: A brass or other metal plate previously "grained" is used as the cathode. By "grained" is meant the scouring of the surface so as to allow the ink to take to it readily. It is then coated with graphite or other material so that the nickel may be stripped. A thin coating of nickel is then given it by electrodeposition, after which a heavy zinc deposit is put on and the two deposits stripped from the brass or other metal plate. The nickel is then left with a surface immediately available for lithographing. It is used in place of lithographic stone.

For certain purposes nickel forms an excellent printing surface as it is hard and is not affected by colored inks.

A Green Dip for Producing a Background for Old Brass Finish.

Some excellent effects may be produced by the use of the following green dip for giving a background on yellow brass articles with the old brass finish. While the dip itself has been in use for some time for this purpose, the formulas given contain too much sal-ammoniac for rapid work on yellow brass. In fact, it is impossible to obtain the desired

Chandelier Ornament, Showing Adaptation of the Green in Producing the Old Brass Finish.

color on it without keeping the sal-ammoniac down to the lowest possible quantity. A number of experiments were made to determine the right point and the following formula was adopted:

Water	1 gallon
Copper Sulphate	12 oz.
Sal-Ammoniac	2 oz.

The ingredients are dissolved in the water heated to as near its boiling point as possible. The brass, previously cleaned, is immersed in the dip and in a few seconds the desired color is obtained. The dip will *not* work cold, and the hotter it is the more rapid will it work.

The color which the dip gives on yellow brass is a yellow-green. After the article comes out of the dip, the high-lights are relieved by wet pumice in the usual manner to produce the "old-brass finish." The green is left in the background. For some classes of work, this dip gives good results as, for example, on the chandelier ornament shown in the illustration.

In case the dip works unevenly and does not give a good color or leave the surface rough and with a dark coating which easily rubs off, then too much sal-ammoniac is used. The remedy is to reduce the amount used. In case the color is not green, but brown or muddy although even, then too little sal-ammoniac is used.

Observations Upon the Electrodeposition of Iron.

In *Zeitschrift f. Electrochemie* A. Pfaff gives the results of his observations upon the electrodeposition of iron. He found, according to his own experience, that a solution of ferrous sulphate (sulphate of iron) in water, to which a small quantity of sulphuric acid is added, the most satisfactory electrolyte. The proportions which he found the best are:

Water	1	gallon
Ferrous Sulphate	5	lbs.
Sulphuric Acid	0.06	oz.

The temperature should be about 150° F. The current strength about 20 amperes per sq. ft. The bubbles of hydrogen gas which form on the deposit should be removed constantly by blowing air into the solution.

Under the above conditions a very smooth and uniform deposit of iron is obtained, quite free from pit-holes, and in portions with a mirror-like surface. If the air current used for agitation is replaced by one of hydrogen gas, and the electrolyte covered with a layer of paraffine-oil, (to exclude the air), no holes or excrescences caused by gas bubbles are found on the deposit, but vertical ridges are formed. When no air current or stirring is used, the hydrogen bubbles which form on the deposit cause unevenness and holes in it. The deposit can be removed in a continuous sheet.

The electrodeposition of iron from a neutral ferrous sulphate solution under the above conditions also led to a uniform and smooth deposit, but it was brittle and broke to pieces when attempts were made to separate it from the cathode.

Electrodeposition of Lead from Perchlorate Baths.*

By Frank C. Mathers.

The electrolysis of most solutions of lead salts gives a loose crystalline deposit upon the cathode, which is valueless for refining or plating purposes. Betts has patented the use of a lead fluo-silicate bath containing free fluo-silicic acid and small amounts of gelatine or glue. This bath gives dense, non-crystalline deposits which are commercially valuable. Without the glue or gelatine, loose crystals are formed, such as are characteristic of the nitrate or acetate baths. "Fluo-silicic acid has some specific property not possessed by the nitrate and acetate solutions, and the solid deposit is not the result of the gelatine alone." The addition of gelatine to acetate or nitrate baths does not give satisfactory deposits.

The author has found that a solution of lead perchlorate containing some free perchloric acid and a small amount of an addition substance, such as glue, tannin, licorice, but preferably peptone, works very satisfactorily as an electrolyte for the plating or refining of lead. Cathode deposits may be obtained over an inch in thickness, very smooth and of a density 11.36.

Lead perchlorate possesses many properties that are ideal for making electro-plating or refining baths. It is "extremely easily soluble in water—one part of salt dissolving in about one part of water." Its great solubility permits the making of solutions of any desired concentration without danger of the crystallization of salts. It is not decomposed by boiling, by alkalies, by acids or by electrolysis. It is unacted upon by the air, and cannot be reduced by nascent hydrogen—not even by the zinc-copper couple. It can only be decomposed by fusion with sodium carbonate or with sodium carbonate or with sodium nitrate. It does not easily give basic salts. When electrolyzed, it gives dense, solid deposits upon the cathode. The efficiency of corrosion of the anode and of deposition on the cathode are near theoretical, so the composition of the bath remains approximately constant. It does not corrode glass or earthenware vessels, which is an advantage, at least in laboratory work. It conducts the electric current extremely well. Perchloric acid solution has a conductivity near that of hydrochloric acid and greater than sulphuric acid.

Sodium perchlorate was used as the starting material for the preparation of the perchloric acid. The solid, dry sodium perchlorate was treated with an excess of concentrated hydrochloric acid. After thorough stirring to break up lumps, the mixture was filtered through asbestos and the residue of sodium chloride was washed with successive small portions of concentrated hydrochloric acid. The filtrate, consisting of a mixture of aqueous perchloric acid, hydrochloric acid and a small amount of sodium perchlorate, was heated on the hot plate until the temperature reached 135°. This completely volatilized the hydrochloric acid with only an insignificant loss of perchloric acid. This aqueous perchloric acid is stable, and is no more dangerous to handle than nitric acid. Impurities, such as sodium chloride and sodium chlorate in the commercial sodium perchlorate, are entirely eliminated by this method, and are only objectionable since they act as filling agents, reducing the quantity of perchlorate acid that may be obtained. The lead perchlorate was made by neutralizing this aqueous perchloric acid with litharge. There is no need to use white lead for this reaction, except perhaps for the sake of speed in the neutralization of the last small amounts of the perchloric acid. In the preparation of lead fluo-silicate, the fluo-silicic acid must be neutralized with white lead, because litharge is strongly enough alkaline to decompose the fluo-silicic acid into silica and lead fluoride. Perchloric acid is a stable acid that is not decomposed by an alkali. Perchloric acid may also be made by treating barium perchlorate with sulphuric acid. It is necessary to heat the perchloric acid thus obtained until the temperature reaches 135° in order to volatilize the hydrochloric acid, since chlorides are generally present in the commercial material. It is best to use an excess of sulphuric acid, which is precipitated later by the addition of the litharge.

The lead perchlorate bath does not give good deposits without the use of some "addition substance", except at very low current densities. Numerous experiments were tried, using high concentration of perchloric acid

*Abstract of a paper presented at the meeting of the American Electrochemical Society, held in Pittsburgh, Pa., May 5-7.

and of lead, but no satisfactory results were obtained.

The addition of small amounts of certain substances to plating and refining baths for the purpose of eliminating or restraining crystals and of improving the density, color and smoothness of the deposits has been a very common practice, or, at least, has been frequently described.

Perhaps the best known example in commercial work is the use of glue in the lead fluo-silicate bath described by Betts. His patent calls for "reducing agents," and he finds that "gelatine, pyrogallol, resorcinol, saligenin, orthoamidophenol, hydroquinone and sulphurous acid" are available. He recommends gelatine because it is the cheapest and gives the best results.

In the course of this work many different addition substances were tried. Tannin, pyrogallol, resorcine, licorice and eucalyptus extract all helped to a considerable extent, but "trees" would form at the corners of the cathode whenever the deposit reached a certain thickness. Tannin might be successfully used if no better substance was available. A high-grade gelatine, which was purchased for use in bacteriology, gave poor results. A commercial grade of glue gave fair deposits. Ordinary commercial glue, which is used in the lead fluo-silicate baths instead of the more expensive gelatine, is a very impure product, containing many things, among which is found a variety of peptone. Analysis of some samples of glue and gelatine show:

	Per cent of Gelatine
"Gelatine"	70.95
Superior glue	51.98
Common glue	23.71

Any decomposition of gelatine or glue by ferments or acids forms gelatin-peptones or gelatones. From the fact that the purest gelatine for bacteriological use showed a less beneficial effect upon the lead deposits than a low grade commercial glue, the conclusion was drawn that some impurity in the glue was responsible for the good work. Glue which had been warmed for several hours with perchloric acid to form gelatin-peptone was tried. The results were uncertain—sometimes good, but more often bad. Acting along the line of this theory, meat peptones were tried. Two different brands of these meat peptones were used—Wittes', probably the purest to be obtained, and a commercial sample from Merck, which was five years old and badly decomposed. Both gave approximately the same results, consequently Wittes' peptone was used on account of its greater convenience and lack of foul odor. Experiments showed that about 0.03 to 0.05 grams of this peptone per 100 c.c. of solution was required. This quantity should be renewed after four or five days, in other words, after the passage of about 25 ampere-hours per 100 c.c. of solution. An excess of the peptone did not have any bad effect. The baths did not become ill-smelling even after long runs. There is some material present in or is formed from the peptone which separates as a pale yellow flocculent precipitate. This precipitate is not always formed, and the conditions for its production are not known. The presence of this precipitate does not interfere with the working of the bath in any way.

Current Density: Many things have an effect upon the practicable current density. A high current density is favored by concentrated solutions, high percent of free acid, large amounts of peptone, and good stirring. With 5 percent lead, 5 percent perchloric acid, 0.05 percent peptone and enough stirring or mixing of the solution to prevent large changes in concentration between the top and the bottom, a current density of from 2 to 3 amperes per sq. dm. (18 to 27 amperes per sq. ft.) gives good deposits, as shown by the accompanying photographs. With lower current densities, less care need be taken with stirring, proper spacing of the electrodes, acidity and quantity of peptone. For plating purposes, low current densities are recommended. With 0.4 amperes per sq. dec., fair deposits may be obtained from baths containing only 0.2 percent free perchloric acid. With higher current densities, these neutral baths give poor deposits even when large amounts of peptone are used.

Voltage: The relation between concentration of the solution, current density and fall in potential or volts is shown in the following table. These measurements were made upon baths which had been running for several days and which were giving excellent deposits. The anodes were of ordinary commercial lead from a plumber's scrap pile. Two anodes were used—one on each side of the cathodes. The anodes had been made purposely smaller

than the cathodes to prevent, as much as possible, the thickening of the cathodes at the edges.

Precautions.

Chloride and barium salts must be absent. A bath that has been giving good deposits will form very bad "trees" if a quantity of hydrochloric acid or some barium perchlorate is added to it. The injurious action of these substances was accidentally discovered from the fact that some baths, made from reagents containing these impurities, would not give good deposits. There are, perhaps, other salts that would act injuriously, but only those mentioned above have been tried.

Summary.

This paper describes experiments with the lead perchlorate plating and refining bath. The properties of lead perchlorate, which are of special value in a plating or refining solution, are:

1. Great solubility.
2. Cathode deposits which are smooth, dense and free from "trees."
3. Approximately theoretical corrosion of the anode and deposition upon the cathode.
4. Absolute stability under all conditions to which it is subjected in a plating or refining bath.
5. No polarization from the formation of lead peroxide on the anode.
6. Very high electrical conductivity.

The bath should contain about 5 percent of lead, 2-5 percent of free perchloric acid, and 0.05 percent of peptone. A current density of from 2.3 amperes per sq. dm. (18-27 amp, per sq. ft,) may be used. The peptone is gradually used up, and after about four days a quantity equal to the original amount should be added. The free acid, which is very slowly neutralized by chemical solution of the lead, must be restored by the treatment of a suitable portion of the solution with the right amount of sulphuric acid. This precipitates lead sulphate and leaves perchloric acid in solution. The filtrate is to be returned to the bath. The bath gives excellent purification, the cathode being about 99.98 percent pure. The deposit is smooth, coherent, and has a density of 11.36. As a plating bath, the lead perchlorate solution works exceptionally well on account of the absence of "trees" or loose crystals on the edges, even when the deposits reach a thickness of an inch. The bath shows no deterioration with use, and gives as good deposits after two months as at the beginning if the concentration, acidity and the required amount of peptone are maintained.

Meta-Stability of the Common Metals.*

The phenomena attendant on the "tin disease" recently described (this J., 1909, 1139) have also been observed with other metals. Pieces of the metals were rolled to thin sheets, and the latter freed from grease by means of alcohol and ether, and cut into small pieces. On some of the pieces figures were etched by means of a suitable agent: the pieces were then washed, covered with unetched pieces, placed between two iron plates, and heated for a long time at a constant temperature. Just as in the case of tin, it was observed in certain other instances that the etched portion of the other plate, was infected; the infected spot appeared distinctly crystalline under the microscope. (Control experiments at the ordinary temperature showed that similar effects could not be produced by simply pressing together etched and unetched plates). Under different conditions of temperature, the effect described was observed with lead, zinc,brass, and bismuth; less distinctly with copper; but not with nickel. In all cases, the etched metal represented the stable form, and the strained, unetched metal, the unstable form. It is apparent, therefore that the metals, tin, lead, zinc, brass, and copper, as they are used in practice, are in a metastable condition, and that all metals that have been subjected to mechanical treatment suffer from the forcing or strain-disease.

The brittleness of karat gold during rolling is caused by the presence of oxide of copper in it. The oxide forms during the melting.

The second gram of radium has been produced in the Government laboratories at Joachimsthal, Austria-Hungary and is available for shipment. The revenue from the sale goes to the Austrian Government.

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*E. Cohen and K. Inouye in Journal of the Society of Chemical Industry, January, 1910.

An Automatic Furnace for Melting Soft Metals.

A novel furnace for melting soft metals has recently been placed on the market by the Wood & Nathan Company, 1 Madison Ave., New York City. The furnace, which may be called automatic in action, is intended for melting soft metals and pouring them into ingots. It was designed primarily for the melting of linotype slugs and pouring them into ingots for remelting. In the ordinary method of melting soft metals, the molten metal is ladled from the top of the kettle and the dross is taken out with the metal to a greater or less extent. This results in obtaining ingot metal that is contaminated with dross and oxide and which makes poor castings.

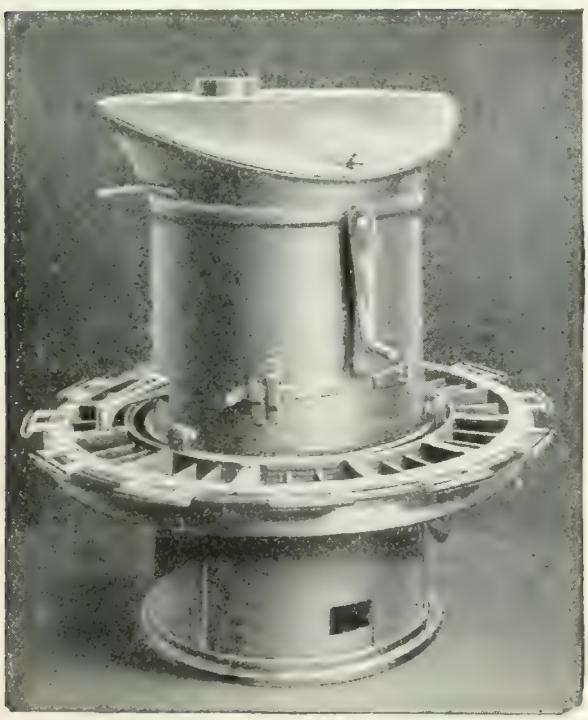


Fig. 1. The Furnace.

The furnace herewith shown is intended to melt the metal, remove the dross and pour it into the molds and in a manner that results in obtaining clean metal. In Fig. 1 is shown the furnace itself. It is heated by gas. The molds, as may be noticed, are arranged about the furnace in a circular manner.

To begin melting, the metal, such as old type metal or linotype slugs, is shoveled into the hopper at the top. The method of doing this is illustrated in Fig. 2. The hopper has been so designed that when filled with the unmelted metal, it will about fill the melting kettle when melted.

Before the metal has melted, the trough in which the molds set is filled with water as

Fig. 2. Filling the Furnace with Metal.

shown in Fig. 3. The water is used for keeping the molds cool so that they may be used continuously. The filling is a simple matter and requires no plumbing fixtures or running water. It is poured in from a pail or bucket.

Fig. 3. Method of Separating the Dross.

When the metal has been melted, the metal is cleansed in the manner indicated in Fig. 4. This is accomplished by rocking the handle in the front of the furnace. The metal is thus

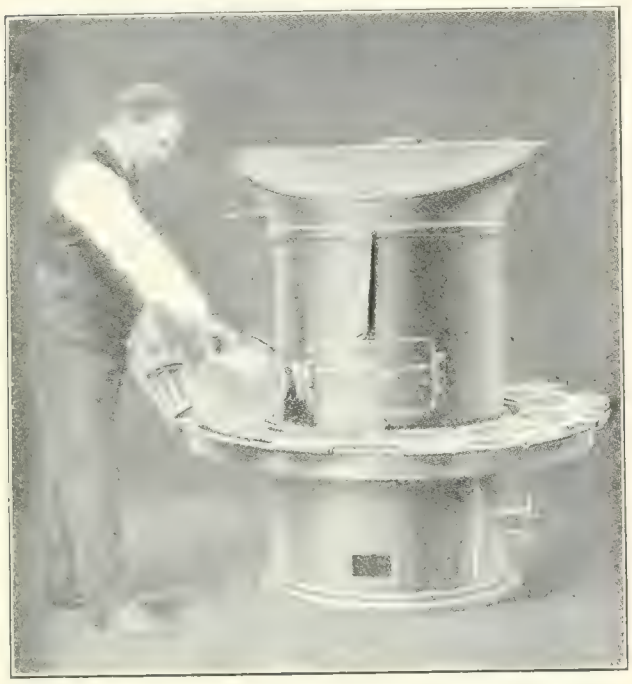


Fig. 4. Filling the Tank with Water for Cooling the Molds.

stirred so that the dross and oxide float to the top. As the metal is poured from the bottom, the forcing of the dross to the top of the melting kettle insures that clean metal can be obtained.

The next operation is pouring the ingots. By means of a handle at the top of the furnace, the valve in the bottom of the kettle is opened and the metal is allowed to flow into the molds. In Fig. 5 the manner of pouring the metal is shown. The molds are arranged on a turn table so that as fast as one is filled with the metal, the next is brought under the pouring spout. When all the molds have been filled, as soon as the last one has been poured the first will have become solid so that the metal in ingot form may be dumped.

Fig. 5. Pouring the Metal into the Ingot-Molds.

In Fig. 6 the dumping of the ingots is illustrated. The molds may be made of any desired shape, but in the illustration the standard size used in re-casting linotype metal is shown. A pipe is attached to the top of the furnace to take off the fumes from the molten metal although in melting clean metal it may be dispensed with as there are practically none. The furnace is quite inexpensive.

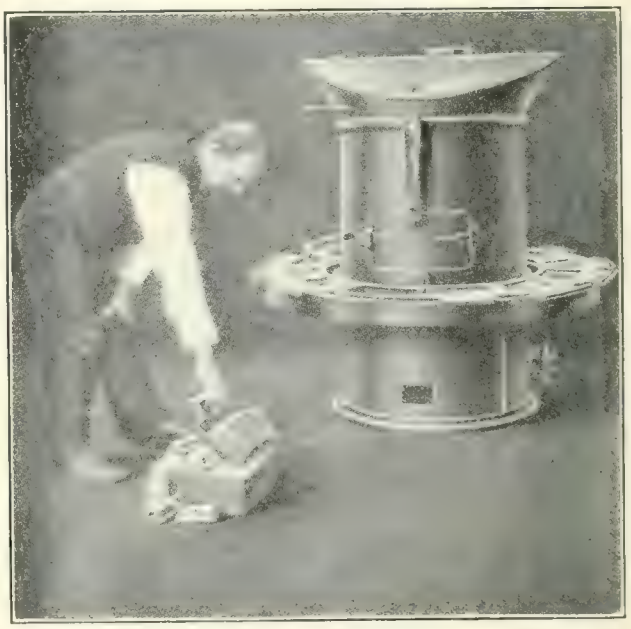


Fig. 6. Dumping the Ingots.

The theory of the use of common-salt as a flux in making brass is that the oxide of copper which forms during the melting of the copper is reduced by it. This is probably brought about by the dissociation of the salt at the temperature of molten copper and it breaks up into metallic sodium and chlorine which escapes. The metallic sodium then acts as a reducing agent and reduces the oxide of copper. This undoubtedly takes place to a greater extent when charcoal is present with the salt.

Type, Electrotype, Linotype, Stereotype and Monotype Metals.

By Alfred McCue*

Most printers know that type-metal is composed of lead, tin and antimony. Few know the proportions, and, probably, none how to determine whether the metal he is buying is according to any certain formula. There are certain facts regarding type-metal, however, which can be ascertained by any printer. If type-metal purporting to contain certain percentages of lead, tin and antimony is offered at less than the market price of these commodities, the printer may be sure that the pretended formula is a sham. Prices of these metals fluctuate, but the daily papers quote the market every day, and the cost of any formula can be readily calculated.

There are some dealers who pretend that their formulas are trade secrets, and who refuse to divulge them to purchasers. The only course to pursue in these cases is a refusal to buy blindly. Any honest dealer will guarantee to deliver goods according to specifications, and the purchaser is warranted in demanding to know exactly what he is buying.

This article has to do principally with metals for casting type. Linotype, electrotype and stereotype metals are made of the same ingredients, the proportions only being varied.

A fine grade of type metal is composed of the following:

Standard Type-Metal Mixture

Lead	58%
Antimony	26%
Tin	15%
Copper	1%

The copper in the metal cannot profitably be increased. A trace of it in type metal gives it a toughness not otherwise obtained. The other elements may be varied, it being understood that the greater the percentage of lead an alloy contains, the softer it will be. The addition of antimony would require the proportionate addition of tin, though increasing the above percentages of these will not result in making a better type-metal. There are certain limits beyond which the metals will not properly amalgamate.

Besides the proper proportions of lead, tin and antimony, the other important factor in the preparing of type-metal is the method of mixing. Unless mixed intelligently, the formula will not save it.

In mixing these metals it must be remembered that each element has a different melting point. Lead melts at 617°, tin at 442°, and antimony at 806°. So, in order that they properly amalgamate, consideration must be given this point. If the temperature of the mixture does not reach the melting point of the antimony, it stands to reason that this element will not amalgamate with the others. A thermometer should be employed to verify the heat; but, in its absence, a stick of pine can be used to test the mixture, which should be hot enough to char it a dark brown. Pure lead, Straits' tin and Cookson's antimony should be used.

The following describes the process of mixing the metals: Place one-half of the quantity of lead in the kettle, with all of the antimony. Heat it until the metal is hot enough to char a pine stick dark brown, and stir vigorously until the antimony is amalgamated with the lead. The tin should then be added and stirred well, keeping the temperature to the point indicated above. Then slowly add the balance of the lead, a pig at a time, stirring meanwhile and allowing time for each to melt before adding another. When all the lead is in the kettle, stir thoroughly and skim off clean. Then allow the metal to cool and pour off into molds.

The formula here given for type-metal will bend slightly before breaking. The linotype metal formula will produce a metal which will break when the ends are about an inch apart

The grain of the metal at the point of fracture will indicate to an experienced eye something of the ingredients of a sample, but unless the temperature at which the metal is mixed and poured is known, this test is misleading. For instance, the broken pig of metal shows a coarse glittering grain, while the type cast from such a metal will show a fine, compact grain. It all depends on the temperature at which the cast was made, as also the pressure employed in casting.

Type-metal should always be melted in a large furnace or kettle, the larger the better.

*Abstract of a paper on "Talks on Type Casting" in the Inland Printer, January, 1910.

A more uniform mixture is possible when melted in large quantities. The metal should be brought to a high temperature and thoroughly stirred. Skimmings from the metal-pots should be placed in the furnace kettle and reduced. Lead oxide rises in the form of black powder, and no metallic substance should be thrown out as dross. Sal ammoniac, mutton or beef tallow or fats of any kind, rosin, green pine wood or raw potatoes can be used to separate the oxide from the metal.

A good electrotype metal is made as follows:

Standard Electrotype Metal

Lead	93%
Antimony	4%
Tin	3%

Linotype metal must be harder than electrotype metal and softer than type metal which contains too much antimony for casting in the linotype machine. The following is the standard formula:

Standard Linotype Metal

Lead	83%
Antimony	12%
Tin	5%

For use in the monotype machine the following mixture has been found to work the best:

Standard Monotype Metal

Lead	74%
Antimony	18%
Tin	8%

Stereotype metal is about the same as linotype metal. The following is the mixture generally used:

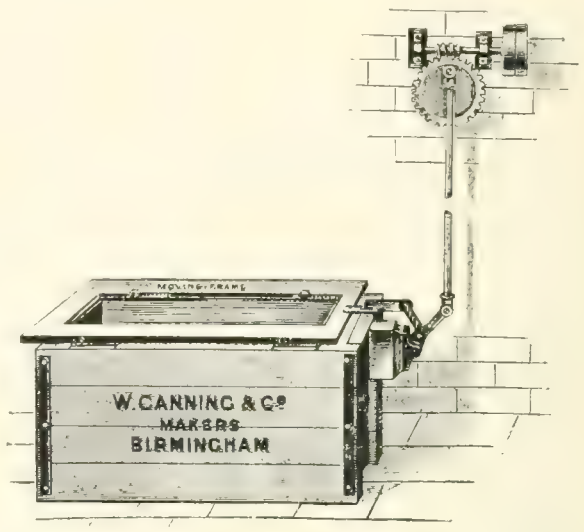
Standard Stereotype Metal

Lead	82.5%
Antimony	13.0%
Tin	4.5%

The presence of zinc in the metal can be detected by heating up a small ladleful until it becomes red hot, when, if zinc be present, bright blue and green colors arise. Zinc is most deleterious in type-metal and should be carefully excluded. It can be eliminated by heating the metal to a red-hot state, skimming clean and stirring until it revolves rapidly in the kettle. Then throw into the metal two or three pounds of granulated sal ammoniac, and skim clean.

An English Method of Agitating Plating Solutions.

An appliance for moving the work in a plating solution while being plated, which is, of course, equivalent to agitating it, has been placed on the market by W. Canning & Co., of Birmingham, England, the well known English manufacturers of plating apparatus and supplies.



Canning's Method of Agitating a Plating Solution by a Movable Frame on the Tank.

The appliance consists of a frame which sets upon the top of the plating tank and upon which the rods from which the work is hung are placed. This frame is moved back and forth by an arm actuated by power so that the work is constantly in motion while it is being plated. A higher current density may, therefore, be used and gas bubbles which attach themselves to the work are shaken off.

The Alloys of Copper and Cobalt.

In *Bulletin Soc. Chemie,* 1910, page 158, F. Ducelliez describes some experiments which he made upon the alloying of copper and cobalt. The purified metals were heated together to about 1500°C. (2700°F.) in an atmosphere of hydrogen gas.

The alloys thus obtained were magnetic in proportion to the amount of cobalt they contained. Alloys containing more than 70% of copper had a reddish tint while those containing 10% of copper were gray and brilliant, resembling cobalt. The alloys, as far as noted, have no particular use in the arts.

Graphite Babbitt-Metal.

A new material in the shape of babbitt-metal containing particles of graphite interspersed through it has made its appearance in the United States, and like many other interesting articles, originated in Germany from whence it is imported.

This new material has the appearance of a homogeneous mass and is used for bushings and bearings. It is not melted and poured like babbitt-metal as this removes the graphite, but must be machined. The graphite in it acts as a lubricant.

Graphite and Babbitt-Metal Cylinder Made from Plastic Metal and Graphite.

The method of making it is based upon the fact that many soft metal alloys become plastic at a certain temperature. For example, an alloy of 90% tin and 10% copper becomes plastic at a temperature of about 420° F., and may be kneaded. Graphite may then be incorporated with the mass so as to render it quite homogeneous. The whole is then subjected to hydraulic pressure in order to compress the mass into a compact material. This can be done while plastic. In the illustration is shown such a compressed shape which was made of graphite and babbitt-metal in the preceding manner.

There are quite a number of soft metal alloys suitable for bearings that become plastic when heated. Some of them are:

Tin	90%	80%	90%
Copper	10%	10%	none
Nickel	none	none	10%
Antimony	none	10%	none

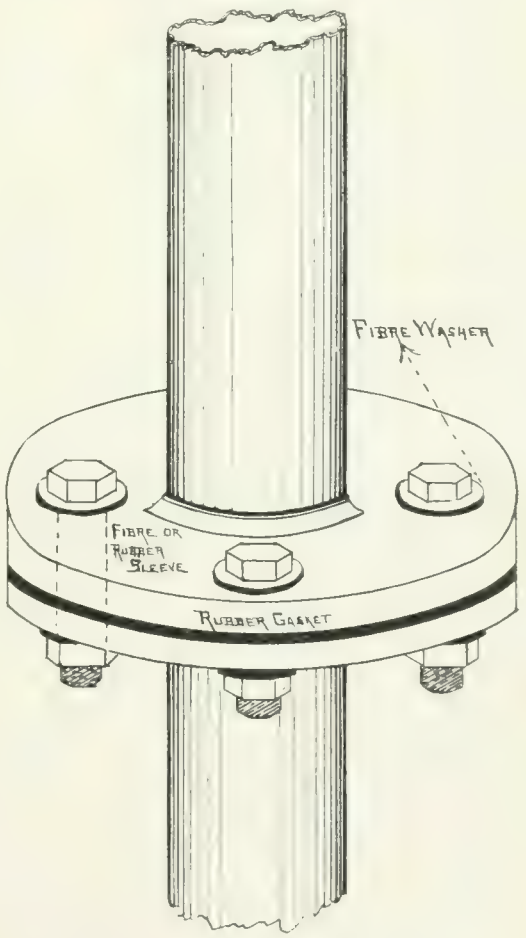
These alloys will become plastic upon heating and graphite may be incorporated with them. They are all good babbitt-metals.

It is also stated that graphite can be incorporated with some of the copper and lead alloys in the same manner in order to make a harder bearing metal, but this point has not been investigated.

Solid Steam-Pipe Connections for Plating Tanks.

By S. G. W.

When steam-coils are used in plating tanks for heating the solution it is necessary to insulate them. If not done, two or more tanks will become connected making the rheostat of little value and electrolysis will soon cause the destruction of the coils.



Method of Making Steam-Coil Connections in Plating Tanks.

The usual method of insulating the steam-coil is by means of a piece of steam-hose. The connection with the steam-coil and the supply pipe is made with the hose. While this forms a sufficient insulation, the rubber soon becomes hard and cracks, thus causing a leak.

A better method of connecting the pipes, and at the same time supplying excellent insulation, is to take a flange coupling, like that herewith illustrated and drill out the bolt holes on the nut side large enough to slip in a sleeve of hardwood, rubber or fibre. A piece of rubber pipe will answer or fibre will do as it is possible to purchase it in the form of tubing of various sizes. Under the nuts a fibre washer is placed, and between the flange a rubber gasket is inserted. A tight joint is thus made and perfect insulation is insured. The fibre washers may be placed under the bolt heads or the nuts. In place of the fibre, in case it cannot be obtained, rubber packing can be used but the fibre is much better as it is harder.

The Use of Tin in Yellow Brass.

By Erwin S. Sperry.

So much composition and scrap yellow brass are now used in the brass foundry that ordinary yellow brass is frequently forced into the background. The statements frequently are heard: It does not cut freely enough, it is not strong enough, or it does not cast well. All these difficulties, I believe, are caused by the growing tendency to use too much spelter in yellow brass. It is the modern method of cheapening things. Brass founders go to work and make a yellow brass containing 60 per-cent of copper and then expect to have it cut well by the addition of a large quantity of lead. It cannot be done. With even a large amount of lead it will still be hard. In order to obtain a free cutting brass, that is one that is really free cutting, the brass itself must be rather low in spelter.

Let us see what an excess of spelter in yellow brass will do. In the first place it makes more smoke (oxide of zinc fumes in melting), and the castings are apt to come ditry. It is hard and tough and lead will not give it the desired cutting qualities for many purposes, and it is not stiff enough for many uses. To offset these qualifications is the one of cheapness.

In order to obtain a good yellow brass casting, (and by this I mean one without aluminum in it, as for many classes of work it cannot be used) I believe that the mixture should contain about 70 per-cent of copper, about 3 per-cent of lead, and about 1 per-cent of tin. Without the tin, the metal will be too soft; but by using it, a good stiff metal can be obtained and it can be made still stiffer by adding more tin. Indeed, the tin forms a flexible agent for altering the qualities of the brass. The lead must be at least 3 per cent in order to have the metal cut freely. Apropos of this mixture, I will say that the best sample of yellow brass casting I ever saw and which cut with the tool in such a manner that nothing more could be desired, was a piece of a sand casting, made in the shape of a large ring. The ring was turned on a lathe by hand and a thread cut on it. The workman who did the turning stated that it was the best sample he had ever turned, yet the brass was sufficiently stiff to hold its shape. I tried the cutting qualities myself and my own experience bore out those of the workmen. It was deemed worthy of an analysis and the following results were obtained:

Copper	70.98%
Zinc	24.04%
Lead	3.11%
Tin	1.30%
Iron	.57%

My own experience has been that this mixture cannot be excelled for a good yellow brass, and if one desires to duplicate it, the following proportions may be taken:

Copper	70 lbs.
Zinc	25¾ lbs.
Lead	3 lbs.
Tin	1¼ lbs.

For much of the ornamental yellow brass that is now being sold in art metal wares, the mixture will be found admirably suited as it casts so well.

Better copper castings can be obtained by melting the copper in a clay or clay lined crucible than in one of graphite. There is always a slight amount of combustion of the graphite when red hot, and the gases formed are absorbed by the metal.

Aluminum cannot be successfully deposited electrolytically, as a commercial proposition, from aqueous solutions. Experiments have shown that even under the most favorable laboratory conditions, with a rapidly rotating cathode, only an imperfect deposit of aluminum can be obtained.

New Water Blast Gas Furnaces.

The success of the furnaces made by the National Economic Gas Blast Co., 88 John St., New York City has been such that they have

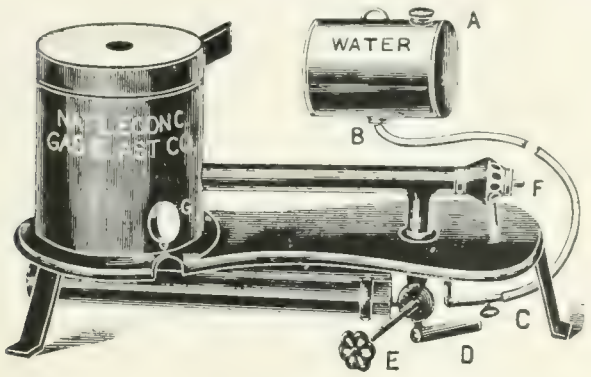


Fig. 1. New Melting Furnace, Using Water Blast.

now decided to manufacture them in larger sizes that can be adapted for commercial work. Following this idea they have recently placed two new types on the market.

In Fig. 1 is shown the new type of melting furnace for melting all kinds of metals in crucibles. It is made of sufficient size so that up to 16 lbs. of copper may be melted in it.

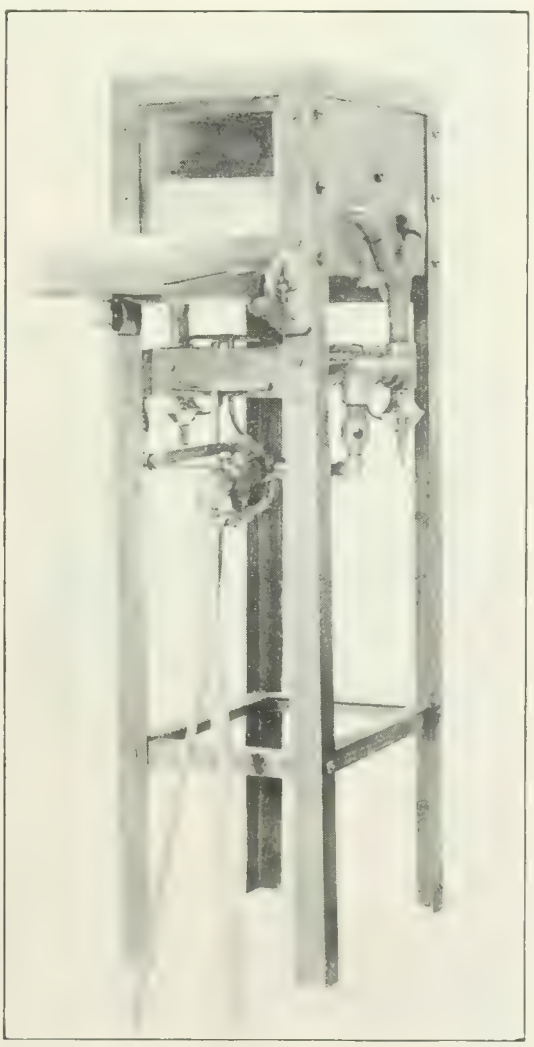


Fig. 2. Annealing Furnace, with Water Blast.

In Fig. 2 a new muffle furnace is illustrated. It is made for annealing, heating, brazing and other similar uses and is adapted for many manufacturing operations.

The furnaces are designed for use with ordinary illuminating gas and no air blast is required. The blast is produced by steam. This is accomplished by the use of a special burner so constructed that the water dropping into it is made into steam and supplies the necessary blast for blowing the gas into the furnace. A small quantity of water only is required and is contained in a small tank from which it feeds by gravity to the burner. As no blower or power is required to operate these furnaces, it will be readily appreciated that for melting or annealing metals in small quantities, they are exceptionally convenient and handy, and require no additional installation.

Babbitt-Metal in Aluminum Chips.

As large quantities of aluminum chips are now produced in the machining of the aluminum castings made for automobile work, and as considerable amounts of white-brass, babbitt-metal and similar anti-friction alloys are used in the same shops that machine the aluminum castings, it is not surprising that aluminum chips are frequently contaminated with these white metal chips. It can hardly be called an adulteration for the reason that, as a general rule, the white-metal chips are worth more than the aluminum. The color of the two kinds of chips, however, is so similar that it is difficult to distinguish between them and keep them separate. Then too bearing surfaces of aluminum are frequently lined with babbitt-metal and the two bored out together. Under such a condition it is impossible to keep the aluminum and babbitt-metal apart.

Aluminum chips find their way back to the founder who makes the castings, or to smelters who run them down into ingot and sell it. As a rule a small amount of babbitt-metal or white brass chips is not harmful as the quantity of tin, antimony, zinc or copper thus introduced into the aluminum has no appreciable effect on the quality; but if the amount is over a few percent, then it is apt to influence the aluminum to a considerable extent. In

case a lead base anti-friction metal contaminates the chips, then it greatly injures them as lead does not alloy with aluminum except to a very slight degree; bnt separates out or segregates, thus producing a weakness in the aluminum castings made from them. It is worthy of note, however, that in automobile work only the best grades of tin-base babbitts or white brasses composed of tin and lead are used so that, generally speaking, aluminum chips, when contaminated with babbitt-metal do not contain lead.

Users of aluminum chips should carefully inspect them and ascertain whether they are contaminated with babbitt-metals or similar white metal alloys. Usually the character of the chips of the aluminum and white-metals is of sufficient difference to admit ascertaining whether there is any mixture of the two.

A Water-Cooled Wire-Die.

In the drawing of wire through chilled-iron or steel dies, the friction of the wire upon the die is so great that a large amount of heat is generated. This causes the die to wear more rapidly, partially anneals the wire and interferes with the production of an accurate size. In order to obviate the heating, James A. Horton of the Iroquois Machine Co., Providence, R. I., manufacturers of wire drawing machinery, has devised and patented a cooling attachment for the wire die used in drawing the wire (U. S. Patent, 957,464, May 10, 1910).

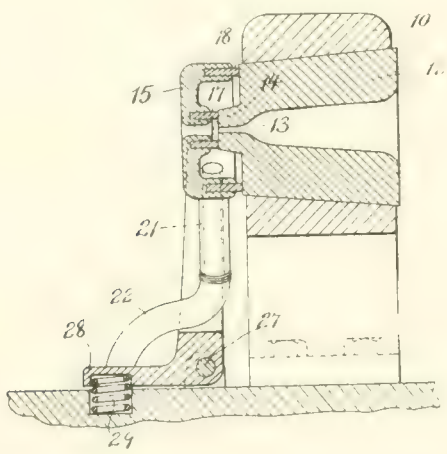


Fig. 1. Cross-Section of Water-Cooled Wire Die.

The cooling device is placed on the delivery end of the die 14. It is in the form of a cap which fits tightly over the orifice of the die. Rubber packing 17 and 18 are inserted in the cap and press against the face of the die rendering the whole proof against leakage. Water is forced through the cap and thus cools the die while the wire is being drawn. Other liquids also may be used instead of water if desired.

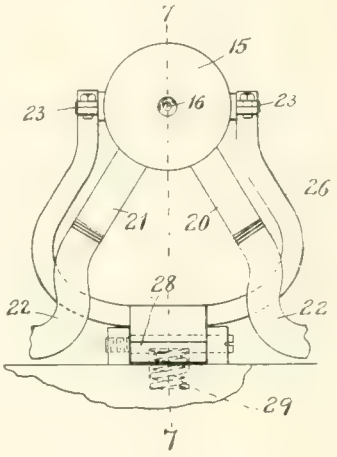
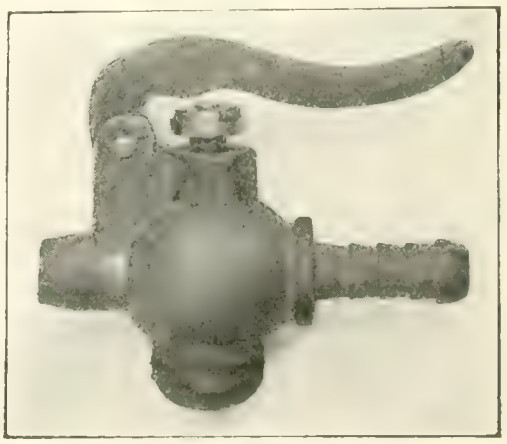


Fig. 2. Front View of the Die.

The "Eureka" Air Nozzle.

This nozzle is for use in foundries and other shops in which compressed air is used and is intended to save air. Those who have a compressed air installation well appreciate that it costs money to compress it and any device that will economize it will save its cost many times over.



The "Eureka" Air Nozzle.

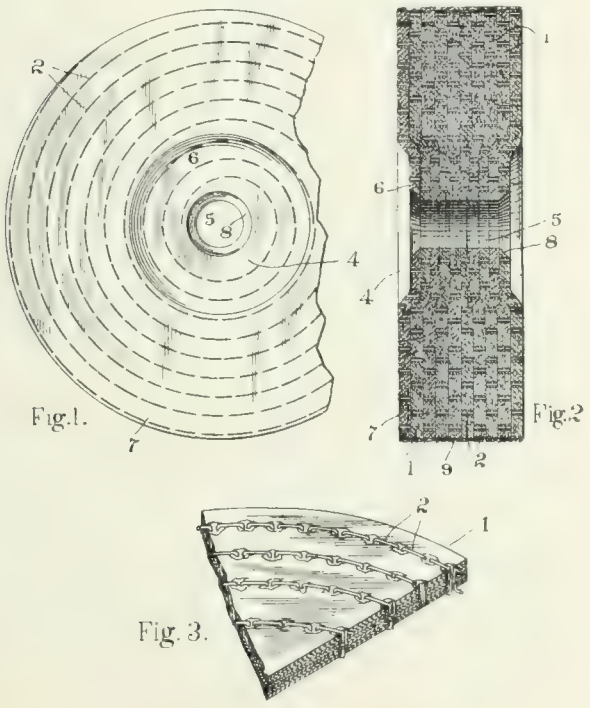
The nozzle is so constructed that when the lever is pressed down to open it, the button on the end of the spindle is forced against a soft rubber washer, when released, thus preventing the escape of air until the lever is again pressed down. The nozzle has a 3/8 inch tail piece which is the size adapted for the rubber hose in general use in foundries.

For use with a sand-blast, the nozzle is exceptionally satisfactory.

The nozzle is manufactured by John H. Melavin, 231 Norfolk St., Cambridge, Mass. A nozzle upon the same principle is also manufactured for use with water.

An Improved Polishing Wheel.

An improved method of making polishing wheels has been recently patented (U. S. Patent 957,496, May 10, 1910) by Stephen A. Cochell, foreman of the polishing department of the Michigan Stove Company of Detroit, Mich. The method of making the wheel is as follows:—



Method of Making Cochell's Polishing Wheel.

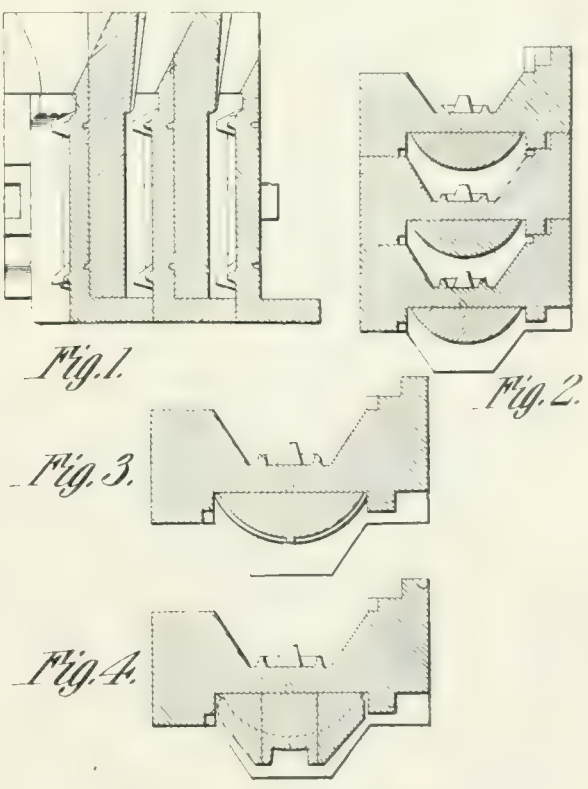
A number of discs of pasted cotton linings or similar goods are sewed through and through by stitching 2, preferably running in a spiral from center to circumference. They are then sized on both sides with weak glue water and balanced to run true. They are then glued together under pressure. The sizing prevents the glue from penetrating the fabric, but the pressure forces it through the holes made by the stitching needle thereby forming a great number of glue cylinders throughout the body.

The central part 4 of the wheel is compressed, and an axial aperture 5 formed therein, the body being made hard enough to be screwed on to an arbor in the usual manner. The recesses 6 which result from the compression serve to receive the customary clamping collars. Discs of heavy "iron-bleached" cotton are glued to each side and serve to supply a good means for bringing the wheel to a true balance. The inner margins of the discs are chamfered or beveled back in order to prevent "ragging-out". The emery is applied to the surface of the wheel in the usual manner by means of glue.

The advantage of the wheel lies in its "lively" or flexible nature. The various sections of cloth, made up as they are, are not saturated with glue, but simply adhere to one another. In this manner the flexibility of the cotton cloth is obtained, and at the same time the glue between each section gives a firm body to it rendering it capable of holding its shape.

A Metal Mold for Casting Car-Brasses.

In order to be able to compete successfully with other makers of car journal bearings, one must have facilities for turning them out



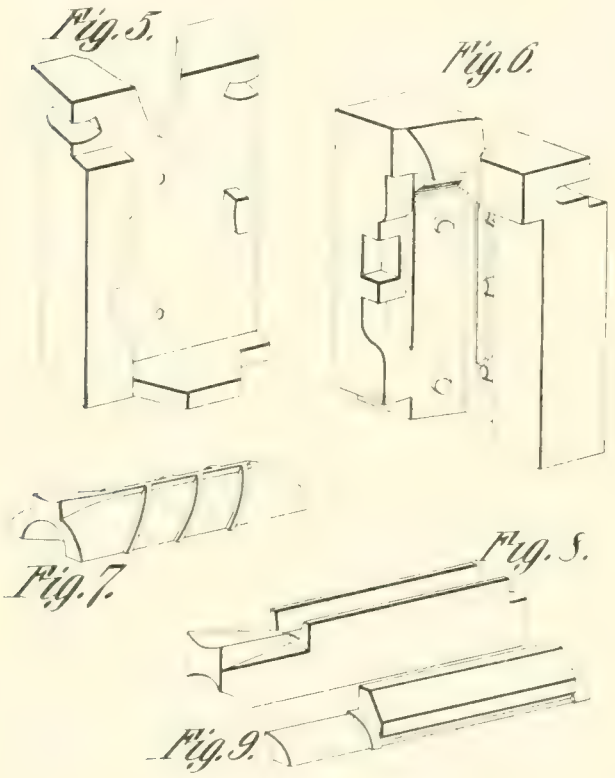
Method of Making the Mold.

very cheaply. Railroads are large users and the business is a constant one; but they also purchase the bearings at such a low price that

unless a brass founder has the equipment and ability to turn out the work at a very low figure, he cannot obtain business.

Geo. L. Hoffer of Laurel, Miss., has recently patented a metal mold for casting car brasses which is intended to do away with the usual sand mold and thus reduce the expense in casting. The mold is herewith illustrated.

The molds are made of cast-iron and those herewith illustrated are designed to make a brass of the Master Car Builders' Standard. The separate members of the mold are designed so that the back of one section acts as the face of another. The molds are cast with



Castings from the Mold.

a foot so that they may be readily set upon a table or the floor for casting. The brass is poured into the mold at the top through a funnel shaped gate. When it has set, the molds are readily knocked apart for removing the casting and are then connected again for a second pouring, thus insuring the rapid making of the brasses.

The mold is so designed that in case a brass that is afterwards to be lead-lined is to be cast, a number of sections can be inserted in the mold which will make the necessary recesses for the purpose. The inventor has been granted a patent upon the mold, (U. S. Patent 956,638, May 3, 1910).

Reducing Tin Oxide with Producer Gas.

A special form of furnace for reducing tin oxide or dross to metal has recently been patented by Robert W. Scott of London, England, (U. S. Patent 957,111, May 3, 1910). The principle of the process lies in the fact that at a red heat, water gas will reduce oxide of tin to metal.

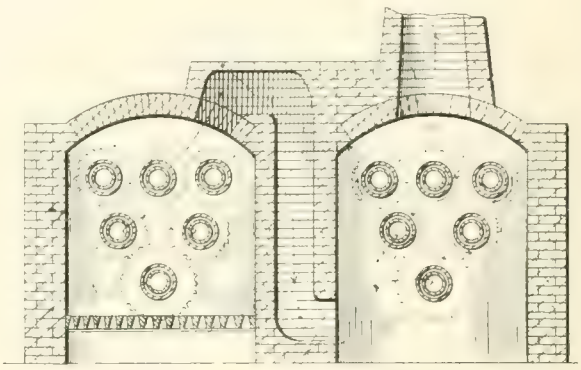


Fig. 1. End View of the Furnace.

The oxide of tin is first dried by the waste heat of the furnace and then placed in the cylinders which pass from one end of the furnace to another and are slowly revolved by means of gearing on the ends operated by power. A slow stream of water gas is passed through and issues from the exit pipe at the back end of the tube.

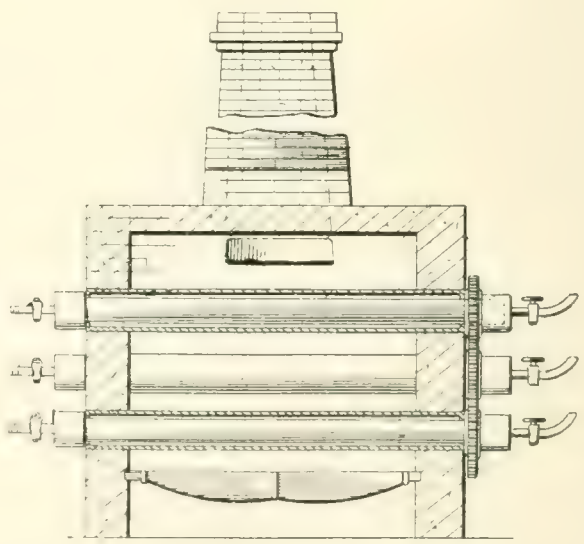


Fig. 2. Longitudinal View of Furnace.

After a time the tin is reduced to metal and will be found in the form of small prills or shot. These are riddled out and melted in a crucible or reverberatory furnace with a flux when pure tin will be obtained.

The "Anthony" Oil Melting Furnace.

The latest and one of the most interesting types of oil melting furnaces to make its appearance in the brass industry is the one now placed on the market by The Anthony Company*, 45 West 34th. St., New York City. The furnaces that have already been installed indicate that metal may be melted in it with a very low oil consumption and with a long life to the crucible.

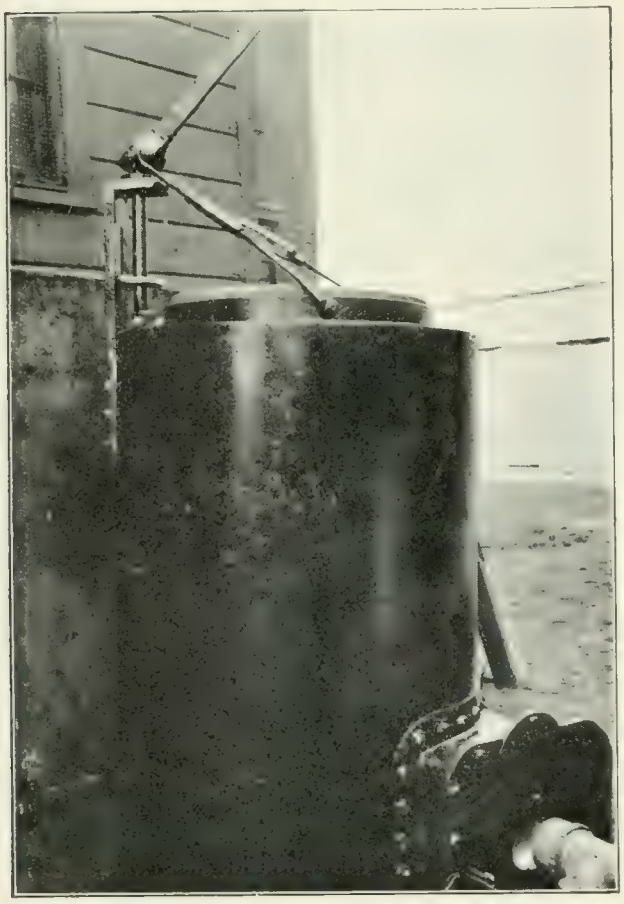


Fig. 1. The "Anthony" Brass Melting Furnace.

This furnace is the outcome of placing the burner made by this company on the market, and which was first described in The Brass World, February, 1910. ("A Self-Atomizing Oil-Burner"). This burner is constructed upon a new principle and is a departure from the ordinary type of oil-burner in that it uses a low air pressure and a high oil pressure. The oil at this pressure atomizes itself in the form of a mist or spray and the air is admitted in only a sufficient quantity to supply oxygen for the combustion. In this manner a non-oxidizing flame is produced which burns with very little noise. Inasmuch as the oil is thrown from the burner in the form of a spray, the flame is free from the blowpipe effect which injures the crucible. Since the aforesaid article was published, the burner has been greatly improved so that it is now even better adapted for brass melting. The

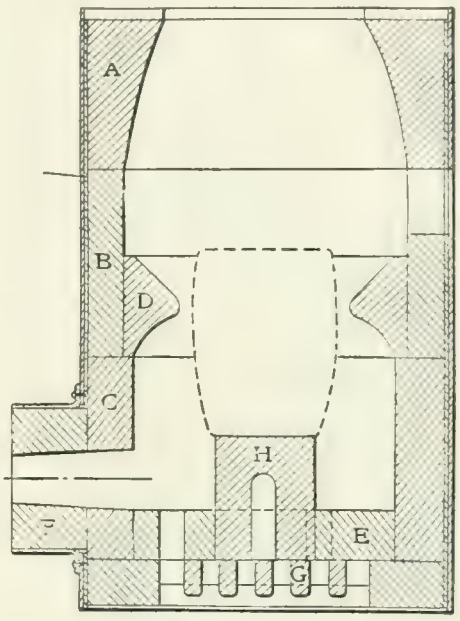


Fig. 2. Cross-Section of the Furnace.

flame that is produced by it resembles gas more than one of oil on account of the manner in which it burns. A new type of strainer for removing the foreign matter from the oil before it reaches the burner, is also being man-

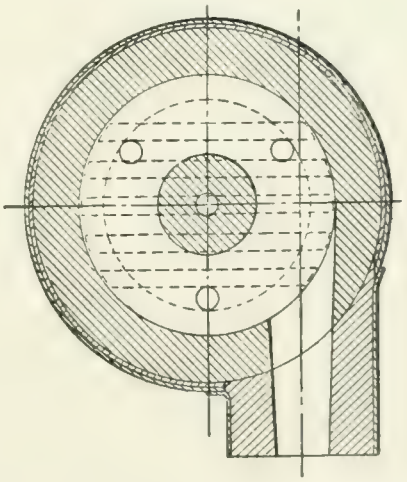


Fig. 3. Plan of Furnace in Cross-Section.

ufactured by this company and it is a valuable accessory in the equipment as it prevents the burners from becoming clogged while metal is being melted.

The new furnace which the company is now placing on the market is unique in that it may

*Successors to The American Combustion Co.

be used with either oil, coal or coke. The change may be made in about 20 minutes. While it is found that there is no desire to change to coal or coke, conditions might arise in which it would be found advisable, and in such a case the furnace can be used without any extra installation. This feature is one not previously attempted.

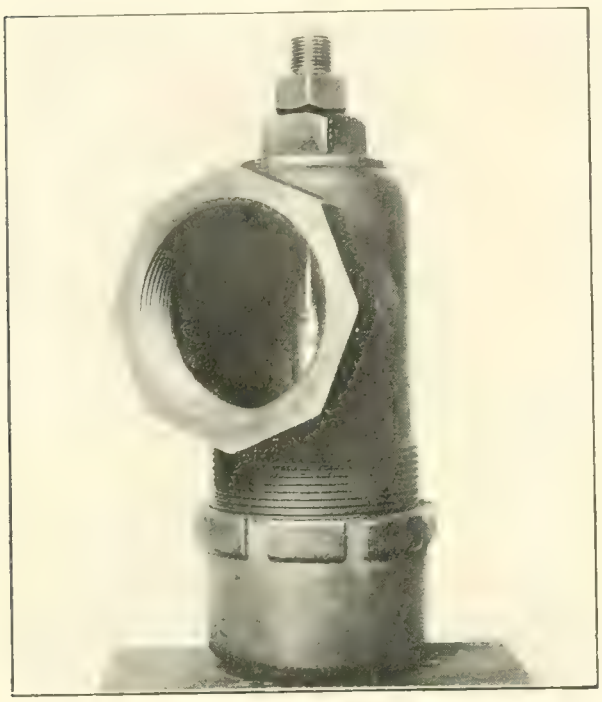


Fig. 4. The Oil-Burner.

The furnace itself is constructed as follows: The outer shell is made of one-quarter inch steel, inside of which is an asbestos lining. Fire brick is then laid around it. These bricks are made in the form of circular shapes which fit inside in the manner shown in the sketches and with only the joints shown. This method makes a firm lining and one easily repaired.

The crucible (nothing but crucible furnaces are made) sets upon a pedestal as shown and in the bottom are slag holes for allowing spilled metal, etc., to run out. At a height corresponding to about the bilge of the crucible, a baffle ring of fire brick is set in. This serves to deflect the flame and causes it to envelop the bottom of the crucible where the heat is most needed in melting the metal. The top of the furnace is also choked as shown in order to produce the desired effect in the combustion.

The oil flame strikes the furnace at the side and is deflected at a tangent and immediately envelops the crucible with a soft, reducing flame so much desired in the melting of metals, and which gives such excellent results.

To indicate what can be done with the furnace and the oil-burner, the following tests

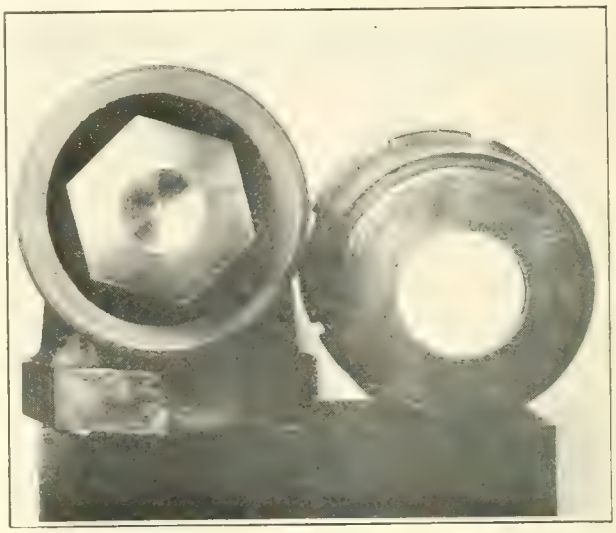


Fig. 5. Front View of Oil-Burner with Cap Removed.

are cited. They were made in one of the large brass concerns in Connecticut. The metal melted was high brass containing between 60 and 65 per-cent of copper. A No. 70 graphite crucible was used, and holding from 175 to 200 lbs. of brass:

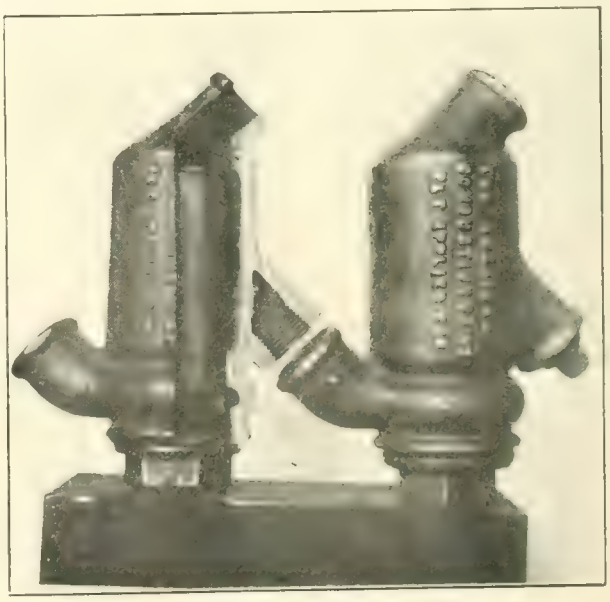


Fig. 6. The Strainer.

Oil Pressure .... 45 lbs. (Approximately)
Air Pressure .... 3½ oz.
Temperature of Oil 150°F. (Average)

The furnace was run continuously during the working hours for 21 days during the month of February and the results were:

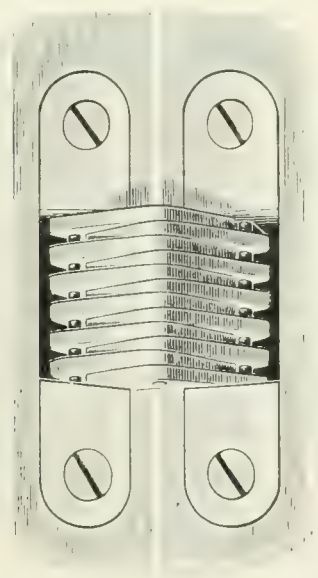
Average Time of Melting..... 1.34 hours
Average Oil Consumed per Hour.. 3.11 gals.
Metal Loss, lowest 0.80%
Metal Loss, highest 1.13%
Average Life of Crucible ..... 27¾ heats

In these experiments, the brass melted was part new metal and part scrap so that the figures are all the more interesting on this account.

The advantage of this furnace lies in the use of the self-atomizing burner which gives a soft, reducing oil flame of even intensity, the form of furnace which throws the heat around the bottom of the crucible where needed, and in the fact that the furnace may be used with either oil, coal or coke.

A Difficult Die-Casting.

A difficult piece of work in the shape of a die-casting is now being made by the Soss Mfg. Co., 453 Atlantic Ave., Brooklyn, and which is herewith reproduced. It is called an "invisible hinge" and is used for many classes of work in which hinges are employed. The object is to avoid any portion of the hinge showing when the door is closed.



Complete Hinge Made Without any Machine Work.

The hinge is now cast in metal molds under pressure from a special, hard, white metal so that the completed casting is ready for assembling and requires no fitting or finishing except plating. By an inspection of the hinge it will be noticed that to make it by machining in the regular manner would be quite costly.

The Blowpipe vs. the Soldering Iron.

It is not unusual to find a soldering-iron used in soldering metals when there is no excuse for the mistake. The soldering iron is only a makeshift or substitute and is used because it is portable; but when it is possible to obtain blowpipes and torches of all descriptions, there is no reason why anything else should be employed except in some instances where the soldering-iron, on account of its portability, is necessary.

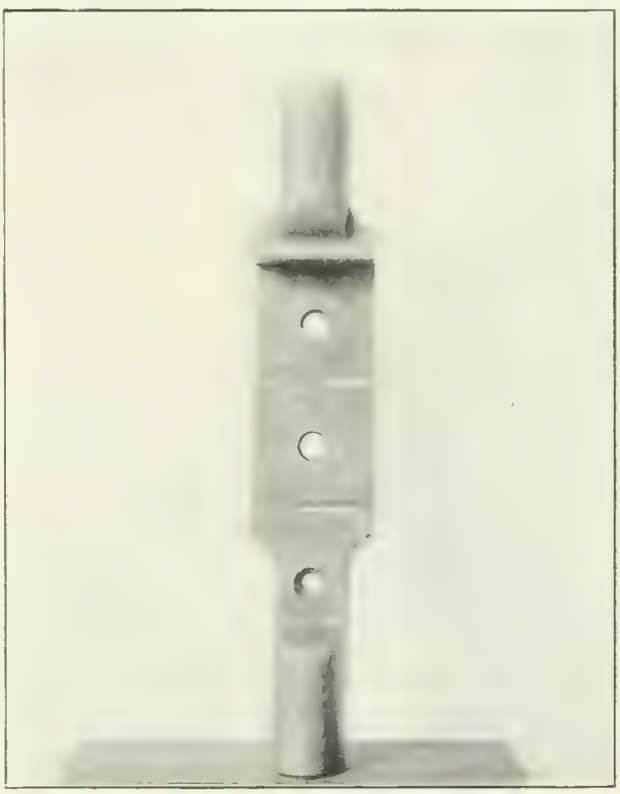


Fig. 1. The Pieces Soldered Together.

In many instances the soldering-iron gives only an imperfect joint, and while the *appearance* of the joint may be good, it is defective and fails to give the service necessary. An instance of this kind is herewith illustrated. Two heavy pieces of copper used in an electrical installation had to be soldered together and the soldering iron was brought into use. The joint, however, proved to be defective, and when broken, showed that the solder had not penetrated the whole joint. In Fig. 1 the pieces soldered together are shown. In Fig. 2 the joint soldered with the soldering iron may be seen. It will be noticed that the solder has covered only the outer rim of the joint. The reason for it was the fact that, owing to the high conductivity of the large masses of

copper for heat, the heat of the soldering iron was rapidly taken away and the solder was simply "smeared" on the surface. It was impossible to render the metal sufficiently hot to

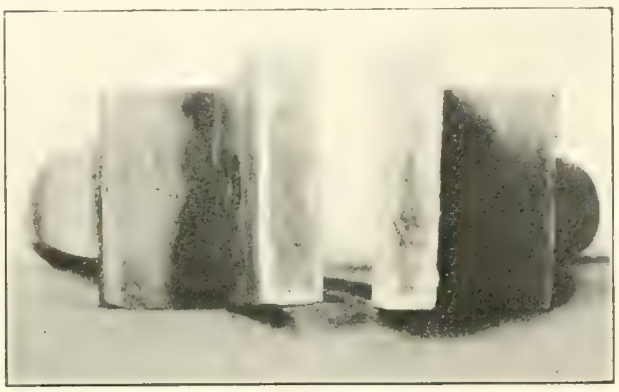


Fig. 2. The Piece Soldered by a Soldering-Iron. Showing Imperfect Joint.

cause the solder to "sweat" into the whole joint. In such cases, where the heat is barely above that of the melting point of the solder, it does not adhere well.

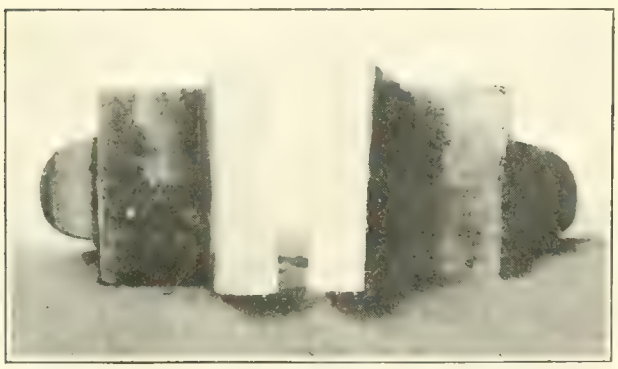


Fig. 3. Soldered by a Blowpipe. Solid Joint.

In Fig. 3 is shown the same joint soldered by means of the blowpipe and then broken. The solder penetrated well and formed a solid and firm joint.

Asphalt in practically unlimited quantities exists in Venezuela and is now being mined and shipped to the United States from there.

A simple method of testing cylinder oil is to heat it to a temperature of 480 degrees F. At this temperature, low grade oils will darken while satisfactory oils will hardly change color. It is practically the same condition that exists in an engine cylinder. A thermometer is inserted in the oil while it is being heated.

A New English Bright Annealing Furnace.

A new furnace for the annealing of metals without oxidation has been invented by M. Pedersen of Dursley, England (U. S. Patent, 955,989, Apr. 26, 1910). The furnace is made in two types as herewith illustrated:

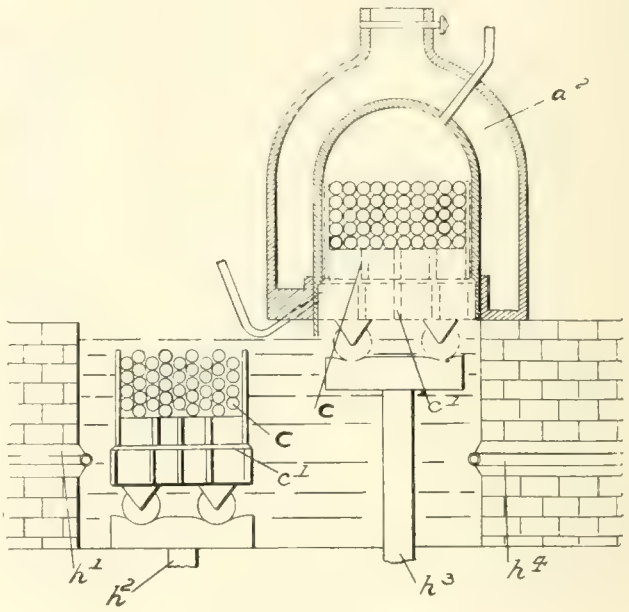


Fig. 1. Furnace for Annealing Tubes.

In Fig. 1 is shown the method of annealing rods or tubes. They are placed on a carriage which is operated by a hydraulic lift or similar device. By means of the lift, the tubes

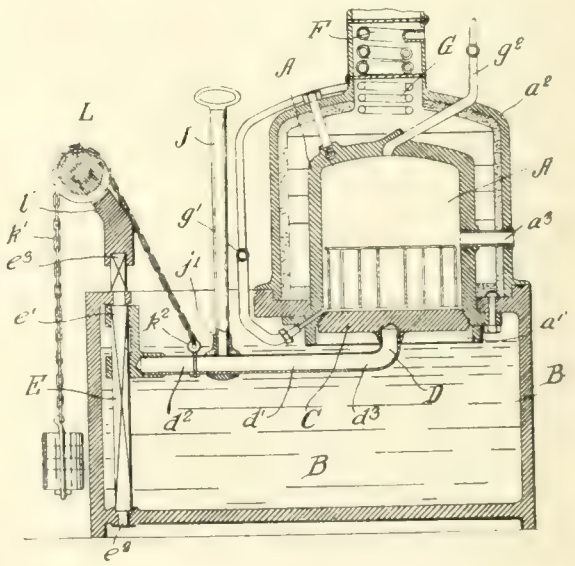


Fig. 2. Another Type of the Furnace.

are raised to the furnace and annealed in an atmosphere of steam, if of brass or copper, or gas, such as producer or illuminating gas. if of iron or steel. When annealed, the car-

riage is lowered and without coming in contact with the air is immersed in a tank of water below the furnace. The tubes are thus annealed without oxidation.

In Fig. 2 the carriage is lowered by a crane, but the annealed material is immersed in the water in the same manner as in the other furnace.

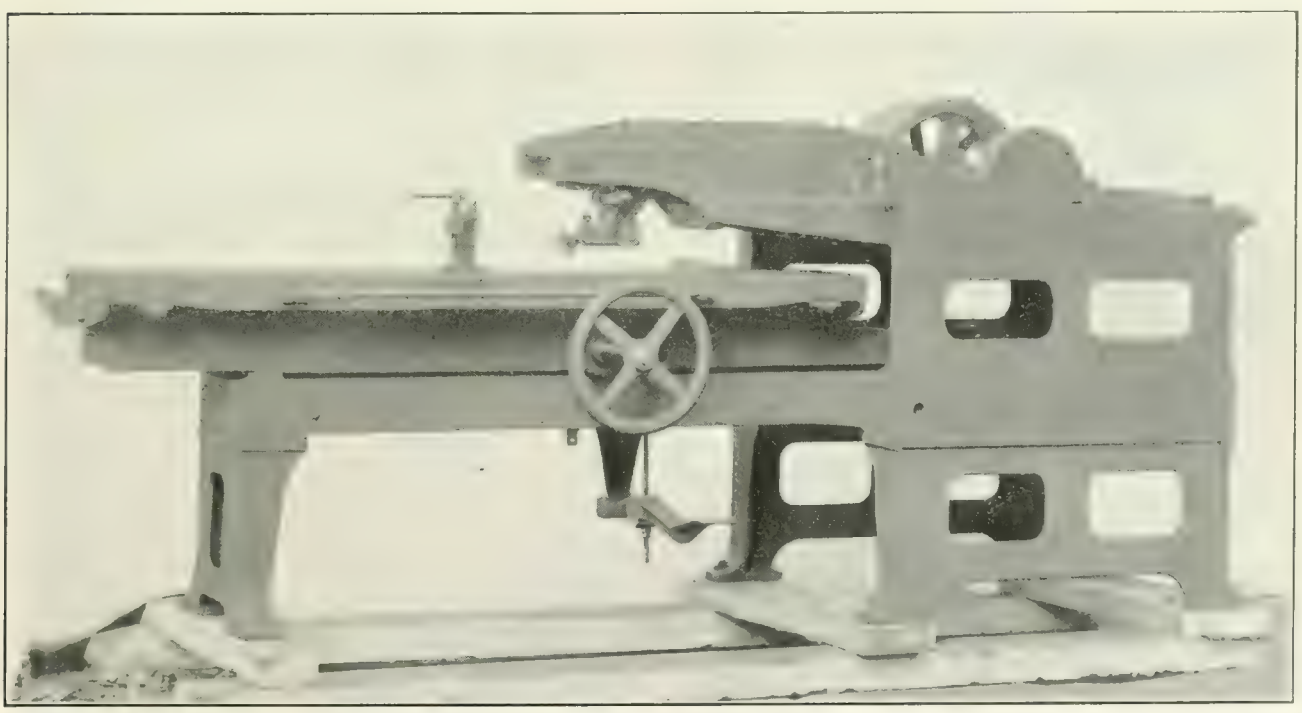
In the illustrations, the muffle used for annealing may be heated by producer gas or other means and is situated over the tank of water B. In Fig. 2 a coil of pipe F in the top of the muffle acts as a flash boiler and water is allowed to drop into it thus supplying steam for filling the muffle with a non-oxidizing atmosphere.

A New Metal Scraping or Overhauling Machine.

In the early days of brass manufacture, brass bars for rolling into sheet were scraped by hand. It was a slow and expensive method. In 1854, J. Stever of Bristol, Conn., invented the first machine for doing the work by power and for years this machine was manufactured by the Waterbury Farrel Foundry & Machine Co., of Waterbury, Conn., and every brass rolling mill in the United States was equipped with one or more of their machines.

Change in conditions in the brass trade, however, made it imperative that a heavier and more powerful machine should be constructed with the result that this company designed and manufactured for many years an "Improved Stever Machine" which, while embodying all the features of the original Stever machine, was capable of turning out a greater amount of work per day.

The advent of the so-called high-speed steels on the market within the last few years has now created a demand for a machine even more powerful than the "Improved Type" previously mentioned. It was found that by the use of such special steels for the cutting tool, the speed of the machine could be increased and a heavier chip taken. Such conditions, of course, necessitated the changing of the design to accommodate the special steel cutting tool, and the result has been that a very powerful and new type of scraping or overhauling machine has been placed on the market by the Waterbury Farrel Foundry & Machine Co. The new machine is herewith illustrated.



The New Type of Heavy Overhauling or Scraping Machine Made by the Waterbury Farrel Foundry and Machine Co.

An important feature of this new machine is the proportion of the table upon which the brass bar is clamped for overhauling. It is

designed so that it can be readily shifted without any appreciable effort on the part of the operator. The table is so constructed that chips will not clog it, and it is unnecessary to stop the machine to clear them away. This fact insures the maximum output. One of the valuable features of the machine is the location of a support immediately under the center of the table. The use of a rack and pinion paralleling arrangement makes this possible and has supplanted the old segment lever arrangement. It is entirely covered up and chips cannot clog it.

The down and end thrusts on the table are cared for by separate sets of rolls, and run against flat surfaces instead of grooved ones as previously used. The scraper is made from a single bar of special steel. The end is ground off to sharpen. No forging is required. It is clamped in the tool holder from which it is easily removed for sharpening. It is recommended that a stock of these tools be kept ground ready for use so that a new one may be set in the holder when a sharp tool is required, thus obviating the loss of time by the operator constantly sharpening one tool.

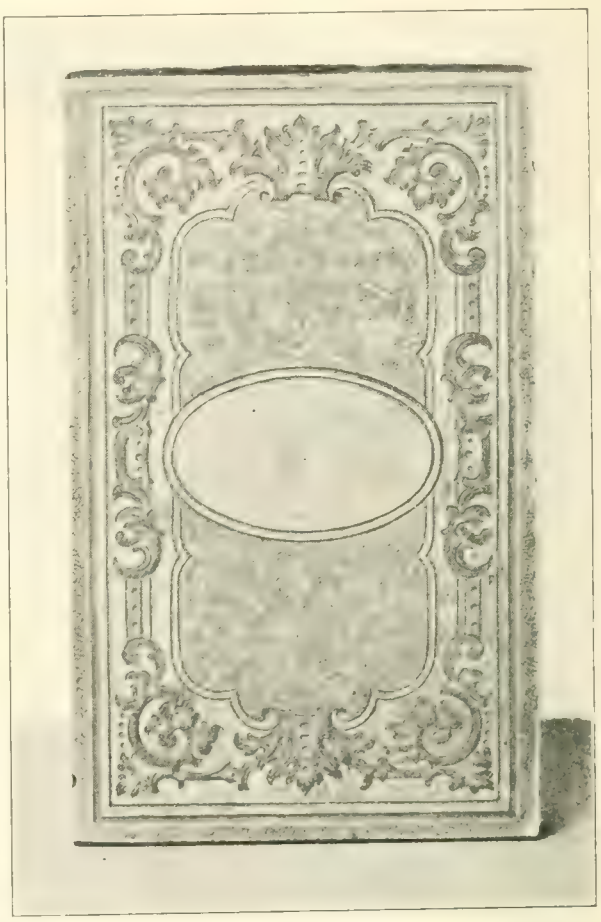
The machine can be driven by belt or motor, but the latter is the most satisfactory as the drive is then positive. The machine is the invention of Percy R. Bissell and is manufactured by the Waterbury Farrel Foundry & Machine Co., of Waterbury, Conn., the well known manufacturers of brass rolling and metal working machinery. It is adapted for rapid and heavy work and the output of the brass rolling mill can be increased by its use as a greater quantity of scraped bars can be turned out per day by the operator.

Case-Hardening Bronze Dies.

While bronze cannot be hardened by quenching or by the absorption of carbon like iron or steel, it is possible to case-harden it in another manner so that its value for certain lines of work is greatly increased. The method used is by coating the surface of the die with pure tin, and then heating the die to a low red heat in order to alloy the tin with the bronze metal on the surface.

Those who have used a copper soldering iron know that after a time, particularly if the iron is allowed to become too hot, the tin actually alloys with the copper at the point and renders it quite hard. The effect is produced by the formation of a hard copper and tin alloy, analagous to bell-metal, on the point of the iron. The case-hardening of a bronze-die is an analagous process. Copper and tin unite in all proportions. When the mixture contains from 20 to 30 per cent of tin, it becomes quite hard.

To case-harden a bronze die, the surface is cleaned from grease by soaking in a strong hot potash solution and then immersing in a



The Case-Hardened Die.

pickle or dip of acid to remove the oxide. A pickle usually answers well and is made by taking 5 gallons of water and 1 gallon of oil of vitriol. The die is allowed to soak in it for several hours until clean. (If hot it works more rapidly). It is then taken out and brushed. The surface need not be bright as long as it is cleaned from any oxide or scale.

The surface is next coated with a strong solution of chloride of zinc. This is to act as a flux and allow the tin to flow on the surface and unite with bronze metal. When this has been done the surface is covered with pure, melted tin. The tin may be melted on the surface by a soldering-iron, but by far the

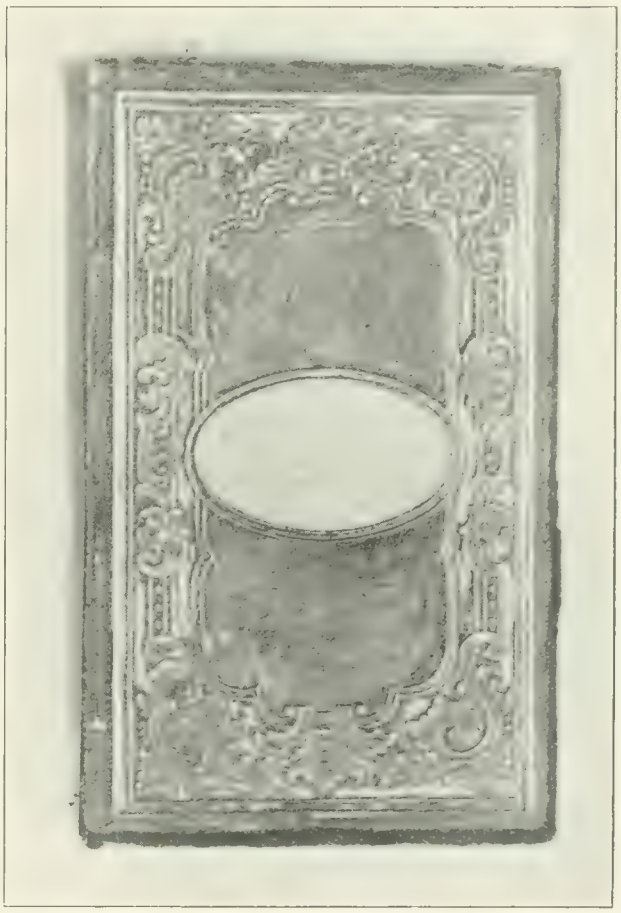
best method is to use a torch or a blow-pipe. In this manner the union is thorough and very little tin is needed. The results are apt to be better than when a soldering iron is employed. The tin is melted over the surface only and as little as possible put on, as the fine detail of the die must not be filled up. When this has been done the die is washed off in water to remove the excess of chloride of zinc flux and the surface examined. If there are any portions which are not covered with tin, the process will have to be repeated; but if it is completely covered, it is ready for the next operation.

While the tin now covers the surface of the die, it is not alloyed with it, and in order to bring it about the die must be heated to a red heat. A muffle is the best method of heating it, but in place of this a blowpipe or torch may be used or any other means which gives a clean heat. By placing fire-bricks around the die when a torch is used, the heat is confined and it is possible to raise it to a higher temperature than when an attempt is made to heat it in the open air.

To prevent the surface of the die from oxidizing, it is advisable to cover it with a strong solution of boracic acid. This acts as a flux and also keeps the air away. Some boracic acid is dissolved in hot water and then this solution is lightly brushed over the surface. A light coat only is necessary.

When the boracic acid has been applied the die is ready for heating. It is placed on an iron plate to keep it from breaking when heated. It is well known that bronze (tin-bronze) becomes brittle at a red heat so that a slight strain is apt to crack it. By placing it on an iron plate there is no danger of this difficulty taking place. The die is heated until it is at a low red heat and allowed to remain in this condition for ten or fifteen minutes to give the tin an opportunity to soak in. When this has been done, the plate is removed and the die allowed to cool. The boracic acid is removed by soaking in hot water and afterwards pickling if necessary. When this has been done, and the operations carefully conducted, the surface of the bronze will be found quite hard, so that it becomes quite difficult to touch with a file. The tin has alloyed with the bronze to form a bell metal.

The application of such case-hardened dies is left to the desire of the user. For stamping leather, soft metals, paper and similar work they last much longer than ordinary bronze. It must not be supposed that such dies are to replace the well known hard bronze dies used in stamping metals as such dies are really as hard as the case-hardened surface. In instances where chasing or sinking is to be done on the die, it is necessary to have it rather soft, and then its life is short. In Fig. 1 is shown a die made from a solid bronze block. The design was entirely sunk in by an expert. The surface has been case-hardened and without destroying the design. In Fig. 2 a piece of leather with the imprint of the die is illustrated. This particular die is intended to produce the design on the leather cover of a prayer book.



Leather Stamped With the Die.

It may be of interest to note that the best results are obtained in case-hardening dies by using a rather soft bronze mixture with as little lead as possible. Such a bronze is high in copper, of course, and is not apt to give trouble by softening or cracking during the heating. A good mixture for this work consists of copper 88 lbs; tin 8 lbs.; zinc 2 lbs.; and lead 2 lbs.

Questions and Answers.

QUESTION No. 809. Should a pair of steel rolls 6 x 6 inches used for rolling strip metal to 0.040 of an inch in thickness be ground with a crown? The strip is 3 inches wide, and when rolled measured 0.040 on each edge and 0.0415 in the middle.

Answer. You will have to have the rolls ground with a slight crown in order to overcome the unevenness in gauge. The spring of the rolls is responsible for the extra thickness in the middle. How much crown to use will have to be ascertained by a trial as it will depend upon the hardness of the metal.

QUESTION No. 810. We have been informed that a small quantity of aluminum in zinc used for galvanizing is beneficial. Will you inform us what its advantage is and how much is used?

Answer. Aluminum is now very extensively used in galvanizing, as it produces a brighter coating and one which is smoother. In order to use it melt 95 lbs. of zinc and 5 lbs. of aluminum together and pour out into small, strip ingots so that they can be readily broken up. To each 100 lbs. of zinc used in the galvanizing kettle add 1 lb. of the zinc and aluminum alloy.

QUESTION No. 811. How can the so-called "copper-finish" be put on steel chain?

Answer. Pickle the chain in a mixture of 9 parts water and 1 part of oil of vitriol until clean and then immerse in the following dip: Water, 1 gallon; sulphate of copper, 1 oz.; oil of vitriol, 1 oz. The copper coats the steel immediately and the chain should then be rinsed and dried. Do not allow to remain in the dip any longer than is necessary to cover it.

QUESTION No. 813. What is the best soft metal mixture for casting in bronze molds? What I wish to make are ash trays and similar articles. I desire to cast them as thin as possible. The mixture must be cheap as the goods are sold at a low price.

Answer. The ordinary cheap mixture employed for this purpose consists of 87 lbs. of lead and 13 lbs. of antimony and is used for most of the cheap work. A much better mixture, and one that will cast thinner, is the following: Lead 8 lbs; tin, 1 lb,; and antimony 1 lb. Owing to the tin in it, this mixture will run very sharply and can be used for quite thin castings for which the straight lead and antimony alloy cannot be employed. It is quite suitable for your trays and we advocate its use.

QUESTION No. 814. What is the formula for the soft, black-nickel that is used on silver plated flat ware for producing the French-gray finish? Owing to the fact that we use a light silver deposit, we cannot use the regular liver of sulphur solution as it attacks the silver to such an extent that it is removed.

Answer. The so-called "soft, black nickel" solution is made as follows: Dissolve 4 lbs. of carbonate of soda in 1 gallon of water. To this add 2 oz. of ammonia water containing all the carbonate of zinc it will take up, and also 1 oz. of ammonia water containing all the carbonate of copper it will take up. Use with a sheet iron anode and a current of about 3 volts. The deposit is quite soft, and while it may be used for flat-ware, we have never heard of its being so employed. It is intended for hollow-ware that can be lacquered. For flat-ware it is really too soft as it will rub off easily. Flat-ware cannot be lacquered and hence it would not be durable. It is quite black.

QUESTION No. 815. What is the effect of metallic tungsten on brass or bronze?

Answer.. Little is known about the effect of tungsten on brass or bronze. At one time a metal called "Platinoid" was made in England in the form of wire for electrical purposes and was said to contain tungsten, but analysis proved it to contain none. It was found to be a German-silver mixture containing a small quantity of manganese.

QUESTION No. 816. What is the cause of the small black or brown spots on oxidized copper work? They appear as spots after the work has been finished and lacquered for some time. The articles are steel hinges and as the steel, of which they are made, is cold rolled I cannot understand why they should spot out although they have that appearance.

Answer.. Your difficulty is, in reality, a spotting-out but it is caused by blisters on the copper. The copper deposit was put on either with too strong a current or with the use of too much free cyanide in the solution. The work, too, may not have been clean. Blisters formed and under them some solution became entrapped which gradually worked out after the goods had been finished, thus spotting or attacking the copper deposit, the oxidized surface and the lacquer.

QUESTION No. 817. We notice in a recent issue of THE BRASS WORLD, a suggestion that molds for making fine brass castings be smoked. What is the best method of doing this?

Answer. The usual method is to pour some gasoline on a piece of waste on the end of a wire or rod, set fire to it and hold under the face of the mold. Owing to the danger of having gasoline in the foundry, kerosene may be used instead.

QUESTION No. 818. What is cyanide of zinc and for what purpose is it used? I have noticed references to it in one or two old books on electroplating.

Answer. Cyanide of zinc is made by precipitating sulphate of zinc by means of cyanide of potassium. It is a white substance that was at one time used in a brass solution,

but on account of its expense and difficulty of making, carbonate of zinc is now used instead. The results obtained by it are equally as good.

QUESTION No. 819. I am making a gear blank for an automobile concern and have used the following mixture: Copper 88 lbs. and phosphor-tin 12 lbs. This makes a good tough gear but the objection to it is that the metal rings enough to make considerable noise when in motion. Would 2% of lead deaden the noise? If not, is there anything else that would answer?

Answer. We doubt whether you would find the addition of the 2% of lead advantageous as it will weaken the metal. We think you are using too much tin as the mixture is quite hard and is approaching bell metal. While a gear made from it is good and hard and will give good service, it is not as well suited to stand shocks as one containing less tin; and it seems to us that in automobile work a gear will have to be made to stand shocks. We suggest the following as it will stand the shock and will not ring as much as the one you are now using:

Copper	90 lbs.
Tin	5 lbs.
5% Phosphor-Tin	5 lbs.

QUESTION No. 820. We are having trouble with our nickel solution in depositing nickel on a wax mold. Small blisters appear on the nickel deposit which spoils it. The solution stands at 6 degrees Beaumé. What causes the blisters?

Answer. Without knowing all that you are doing, we should say that the difficulty is in the use of too strong current. This will cause bubbles of hydrogen gas to form on the deposit which finally produce blisters. The bubbles of gas are the cause of the blisters whether the current is too strong or not, and they may also form if the solution contains too much acid or is deficient in nickel. It may be possible that the addition of single nickel salts will overcome it, but we suggest reducing the current and then, if you are not successful, add the single salts. If the solution is too acid, add carbonate of nickel to reduce the acidity.

QUESTION No. 821. What is the effect of arsenic in sterling-silver, particularly in rolling? We have obtained some silver from the Canadian mines in the Cobalt district and in attempting to refine it find that it is difficult to remove all the arsenic. Our silver cracks in rolling.

Answer. The effect of small quantities of arsenic on sterling-silver is not apparent. When the amount does not reach over 0.05%, the silver seems to work well although it is apt to be more brittle when hot than silver without it. When the arsenic reaches 0.10%, the silver shows a tendency to crack in breaking-down, and when it exceeds this amount, it usually cracks to pieces.

QUESTION No. 822. I am making some silicon-copper castings. They weigh about 125 lbs. each. When we machine the scale off, the castings look dirty, and it is the same all the way through. I am using new electrolytic copper ingots and 2 lbs. of silicon copper to 100 lbs. of copper. The molds are blackened and dried. I also pour the metal good and hot. The dirt seems like a very fine sand. What is wrong?

Answer. We are unable to say whether your trouble is caused by blowholes or dirt without actually seeing the castings, but believe it is the blowholes as dirt or dross can be skimmed off. The method of making copper castings by means of silicon-copper is as follows: Melt the copper under a good layer of charcoal and when it is completely melted, add the silicon copper in small pieces and stir with a graphite stirrer. The reaction between the copper and the silicon causes the temperature of the metal to rise and when this has taken place, allow the crucible to remain in the fire for a few minutes, then remove, skim and add gates or pieces of scrap copper to cool. Pour at as low a heat as possible. You are probably pouring the copper too hot.

QUESTION No. 823. In copper plating plaster of Paris, I have used graphite for coating the surface and making it a conductor, but it then coats very slowly. Is there any method of hastening the deposition?

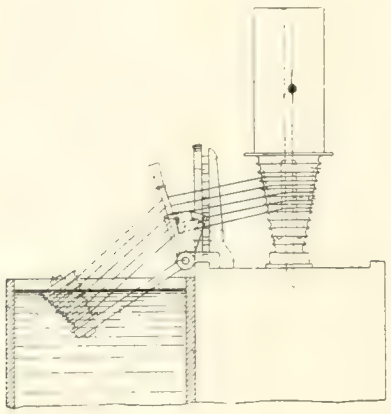
Answer. If you mix the graphite with very fine copper powder you will find that the deposit will form rapidly. Use equal parts. The copper powder must be as fine as the graphite, but it is possible to obtain it as fine as this from a number of manufacturers.

QUESTION No. 824. In making gas-cocks of yellow brass we use yellow brass chips. What is the effect if we add a small quantity of aluminum? We tried it and the castings had a fine appearance and ran very sharply. Those that we tried machined well and were free from blotches. They did not leak when tested although we have heard that aluminum will cause them to leak. Before doing anything we wish to obtain some information.

Answer. The effect of aluminum is to reduce blowholes and give sharp, bright castings; but it is apt to make the castings leak. We have often wondered, however, whether it would not pay eveu though a greater proportion might leak. A greater number of patterns can be put on a gate and the mold can be poured "flat". The metal must be poured quite "dull", however, in order to obtain good castings, and it is on this point that the ordinary founder who is accustomed to pouring yellow brass errs. He pours the brass containing aluminum too hot and the leakages are high. We should like to learn of someone who has tried aluminum in the yellow brass for gas-cocks and has made an exhaustive series of experiments on the matter, pouring the metal flat and at the right pouring temperature.

Patent Abstracts.

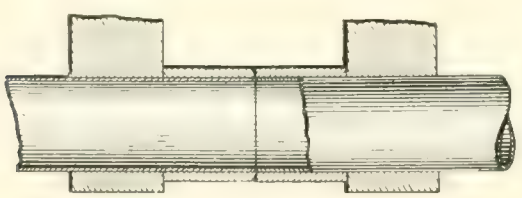
957,093, May 3, 1910. WIRE DRAWING MACHINERY. Andrew Rathbone of Warrington, England. A machine for the multiple drawing of wire. The novelty of the process



lies in the construction of the wire-block and reels so that the wire is drawn through the solution as shown. The machine is claimed to occupy little space and to give a large output with small expense for repairs.

957,564, May 10, 1910. MOLDING MACHINE. Ewald Killing of Davenport, Iowa. Some of the features of this machine are the adjustment in width so that various size flasks may be taken. It may also be raised or lowered to accommodate work and has a flask lowering device not affected by the sand. The machine is so constructed that it will straddle the sand heap and has supporting arms for the pattern plate.

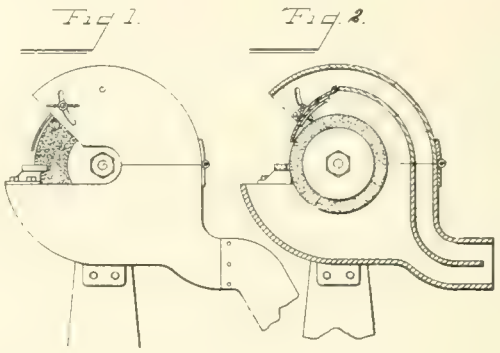
956,984, May 3, 1910. WELDING OF THIN TUBING. Hermann Lemp of Lynn, Mass. Assignor to the General Electric Co. A process of welding thin tubing electrically.



More particularly applied to the welding of nickel tubing. A ferrule is placed over the ends and the whole welded together. The ferrule strengthens the weld.

957,180, May 10, 1910. SOLDERING TOOL. Alexander A. Bedard of Detroit, Mich. A soldering iron with a reservoir in the head and provided with a valve so that any desired amount of solder may be allowed to flow out for the soldering by the pressing of the lever in the handle.

956,762, May 3, 1910. HOOD FOR EMERY WHEELS. George W. Furrow of Troy, Ohio. A hood for use in exhausting the dust from emery or polishing wheels. The hood



is placed over the wheel as shown. It is adapted more particularly for removing the particles which adhere to the wheel and are carried around and forced off by the material being ground. This is accomplished by a hinged shield as shown.

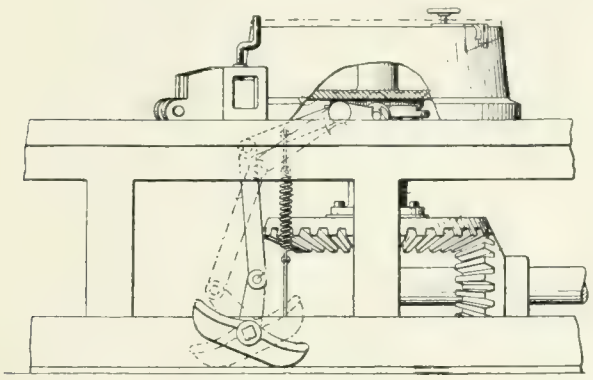
957,199 and 957,200, May 10, 1910. MACHINE FOR BENDING TUBES. John F. Gail of Kenosha, Wis. Assignor to the Simmons Mfg. Co., of the same place. A machine designed for bending brass or brass cased tubing used in the manufacture of brass bedsteads. The machine is so designed that it will bend the tube to the desired curvature in an automatic manner and the parts will then return, without manipulation on the part of the operator, to their original portions, so that they will be ready to receive another piece.

957,198 and 957,201, May 10, 1910. BUFFING MACHINERY. John F. Gail of Kenosha, Wis. Assignor to the Simmons Mfg. Co., of the same place. A machine which will automatically buff and polish small spun articles, such as bedstead mounts, knobs, etc. Two wheels are used. One for cutting down and the other for finishing. The knob or other article to be buffed is fed to an automatic carrier which transfers it, when the first operation is completed, to the second or coloring wheel.

955,946, Apr. 26, 1910. OIL BRAZING-BURNER. Richard D. Conrad of Pittsburgh, Pa. A burner for brazing purposes in

which oil is used for the fuel and by means of which a high temperature can be obtained.

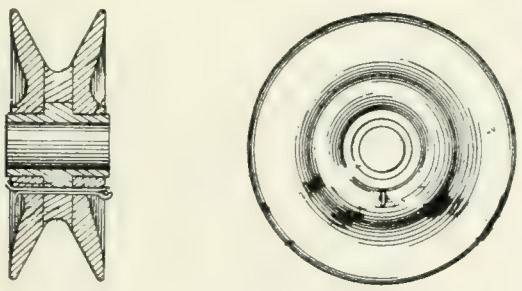
956,885, May 3, 1910. WIRE DRAWING MACHINE. Elbert H. Carroll of Worcester, Mass. Assignor to the Morgan Construction Co., of the same city. A block for drawing



wire in the usual manner. The feature of the invention lies in the use of special mechanism for throwing the block in or out of engagement with the driving power.

955,868, Apr. 26, 1910. ENGRAVING MACHINE. Richard Grieser of New York City. Assignor to the Pollard-Alling Mfg. Co., of New York City. An engraving machine which operates upon the principle of the pantograph. The machine is an improvement upon one patented in No. 703,719, July 1st, 1902 and is intended to simplify it.

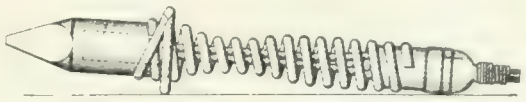
957,655, May 10, 1910. TROLLEY WHEEL. Owen S. Chew, Brookfield Township, Ohio. A trolley wheel made in sections so that when



the groove or other parts wear, new ones may be inserted without destroying the whole wheel.

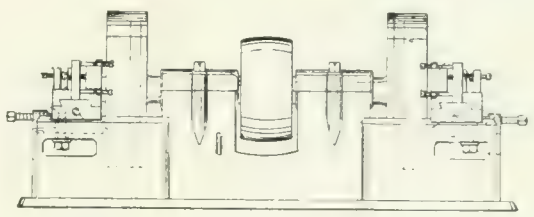
956,769, May 3, 1910. MACHINE FOR ENGRAVING OR SINKING DIES. J. F. Keller and Wm. A. Warman of New York City. Assignors to the Keller Mechanical Engraving Co., of the same city. The die is produced either cameo or intaglio and is sunk from a cast model previously made from a plaster cast. A tracer passes over the surface of the model and is reproduced in the cutting tool which acts on the die.

957,256, May 10, 1910. ELECTRIC SOLDERING IRON. Edwin W. Rice, Jr., of Schenectady, N. Y. Assignor to the General Electric Co., of the same place. An electri-



cally heated soldering iron which is so constructed that the tip will not come in contact with the bench or table when in use. It is accomplished by the spiral tube wound around the tip and which also acts as the handle.

956,645, May 3, 1910. MACHINE FOR GRINDING CUTLERY BLADES AND THE LIKE. Thomas R. Moore of Walden, N. Y. The knife blades (particularly design-



ed for grinding pocket knife blades) are held in a spring clamp and fed to the grinding wheels mounted in pairs. Automatic devices serve to control the feeding and grinding.

958,384, May 17, 1910. METAL FURNACE. Alfred Fisher of Chicago, Ill. A furnace for melting brass and other metals in which oil is used for fuel. The feature of the invention lies in the manner of connecting a battery of furnaces, so that each may be regulated and adjusted independent of the other. In addition, the method of providing for metal from a broken crucible has been changed. The invention is really an improvement upon a previous one (U. S. Patent 828,881, Aug. 1906).

958,180, May 17, 1910. METHOD OF PRODUCING TANTALUM. Johannes Schilling, of Halensee, near Berlin, Germany. The oxide of tantalum is reduced in a current of hydrogen and the hydride of tantalum produced after which it is heated to the melting point and the hydrogen drawn off in an air pump. In other words, it is melted in a vacuum.

957,912, May 17, 1910. ENGRAVING MACHINE. Geo. T. Summers of Russellville, Ky. A machine for engraving metal. The machine operates upon the pantograph principle.

Trade Items.

The Smith Electric Co., of Charlotte, N. C., who now do polishing only, are to start a new department in their plant for electroplating and are now purchasing equipment.

The Star Mfg. Co., recently incorporated in Providence, R. I., with a capital stock of $100,000 are to manufacture bronze powders in addition to gold leaf as previously noted.

The Excelsior Hardware Co., 65 Walnut St., Stamford, Conn., manufacturers of cabinet locks and hardware specialties, are erecting a new factory. This company was recently incorporated with a capital stock of $25,000.

The Chicago-Racine Aluminum, Brass & Iron Works has been incorporated in Chicago, Ill., with a capital stock of $16,000 to manufacture metal specialties. The incorporators are Elmer E. Jackson of 107 Dearborn St., Chicago, and others.

The Latta Tack Mfg. Co., has been organized in Ellicottville, N. Y., for the manufacture of tacks, rivets and similar hardware specialties. Work on the plant has already been commenced. Frank Latta is the president.

The Hope Metal Frame Window Screen Mfg. Co., has been incorporated in, Hope Arkansas with a capital stock of $20,000 to manufacture a rust-porof metal frame for window screens. The frames are to be made in several styles and finishes. A factory is being erected.

The new plant of the General Chemical Company at Newell, Pa., was formerly opened on May 13th. Twelve buildings have already been completed. All are of fire-proof construction. Sulphuric, nitric, muriatic and hydrofluoric acids will all be made at this plant. The general offices of the company are at New York City.

The International Acheson Graphite Co., of Niagara Falls, N. Y., manufacturers of artificial graphite products have established branch offices at 511 West St., New York City; at room 457 Monadnock Block, Chicago, Ill., and at 309 Fourth Ave., Pittsburgh, Pa. The territory adjacent to these cities will be looked after from the individual offices.

The Driver-Harris Wire Company of Harrison, N. J., announce that they are now prepared to supply a superior grade of pure nickel sheet for the trade and also manufacture this metal in the form of ribbon and wire. They state that their nickel is the purest product obtainable, either in this country or abroad. While pure sheet nickel is a material suitable for a large variety of purposes, its use has been retarded, heretofore, by the absence of anyone in this country who could supply it. Those who have been interested in pure sheet nickel, ribbon or wire, should correspond with the Driver-Harris Wire Company.

The Balbach Smelting & Refining Company, Newark, N. J., copper smelters and refiners, are to commence the manufacture of brass ingot metal for the brass foundry trade.

G. L. Le Febvre has bought out the Independent Plating Co., 55 Lincoln St., Boston, Mass., job platers, and will carry on the same line of business.

The American Cash Register Company of Columbus, Ohio, manufacturers of cash registers, are contemplating moving to another location where a large plant is to be built.

The Apperson Bros. Automobile Co., Kokomo, Ind., manufacturers of automobiles, have begun the erection of an addition to their factory in that city and which will be ready for occupancy in about three months.

The Grasselli Chemical Co., of Cleveland, Ohio, and offices at 60 Wall St., New York City are building a new plant at Meadowbrook, W. Va. Acids, chemicals, spelter and cadmium are manufactured by this company.

The Canadian Government is to expend $50,000, which has already been appropriated by Parliament, for research work and experiments for the stimulation of the zinc industry in Canada. The work will be in charge of Dr. Eugene Haanel, the Director of Mines for Canada.

The plant and business of the Benjamin F. Slack Mfg. Co., was recently purchased by the Slack-Horner Mfg. Co., of Denver, Colorado, who are now operating it as before. A jobbing brass foundry business is carried on and a specialty made of aluminum castings. The foundry is located at 1638 Blake St.

The final hearing of the creditors of the defunct Atlas Smelting & Refining Co., of Philadelphia, Pa., which went into bankruptcy some time ago, is to be held on June 7th, at the office of the referee, Joseph Mellors, 528 Walnut St., Philadelphia. A balance of $639.16 is left and which is to be distributed. This company carried on a scrap metal smelting and refining business at 1008 Germantown Ave.

The new oil-melting furnace, which is now being placed on the market by the Anthony Company, 45 West 34th. St., New York City, demands the attention of the trade. The furnace is adapted for melting all metals in crucibles and a low air pressure only is used. The burner is so constructed that the oil is atomized under its own pressure in the form of a spray or mist, and a light air blast only is necessary for burning it. The furnace that this company is making may be used for either oil or coke and the change may be made in a short time. In the furnace a temperature of 3500 degrees Fahrenheit may be obtained with an air pressure of only 3½ ounces. The shrinkage of the metal is very low and the crucible lasts from 35 to 40 heats.

A new factory 63 x 83 is being erected by the Briscoe Mfg. Co., of Detroit, Mich., manufacturers of automobile radiators.

The American Valve Co., has been organized in Indianapolis, Ind., to manufacture plumbing supplies. The capital stock is $10,000.

The Webster Company of North Attleboro, Mass., manufacturers of sterling silver novelties are to add to their plant. They are now employing over 200 hands.

The Uraniumite Company of America has been incorporated in Buffalo, N. Y., with a capital stock of $400,000 to manufacture uranium metal and alloys. A large plant will be built in Buffalo or its neighborhood.

The Wisconsin Automobile Radiator Co., has been incorporated by Gerhard Aussem, 357 Western Ave., North Milwaukee, Wis., and others for the manufacture of automobile radiators. The company has been capitalized at $50,000 and a plant will be erected.

The plating room of P. M. Kohl, 305 Nicollet Ave., Minneapolis, Minn., has been newly fitted and the damage done by the recent fire has been repaired. The manufacture of jewelry is carried on and P. M. Kohl recently succeeded the firm of Johantgen & Kohl.

The Arabol Mfg. Co., 100 William St., New York City, manufacturers of adhesives for all purposes, have recently been allowed a trade mark called "Tinnol" on a paste for pasting labels on tin or lacquered tin cans and boxes.

The J. D. Smith Foundry Supply Company of Cleveland, Ohio, are sending out to the trade a pamphlet describing an equipment of their core-ovens that has been installed in the Ferro-Machine & Foundry Co., of Cleveland, Ohio and which is the largest manufacturer of automobile and marine engine cylinders in the world.

A new plant to cost $400,000 is to be built by the Quick Meal Stove Co., in St. Louis, Mo. It will be located in southwestern St. Louis on the Iron Mountain R. R., and a brass foundry and extensive nickel plating plants will comprise part of the new plant. The company is a branch of the American Stove Co., with plants in Cleveland, Chicago, St. Louis and Lorain, Ohio.

Attention is called to the fact that Kelley & Young, 224 Bakewell Bldg., Pittsburgh, Pa., are now placing upon the market the "R. H. Marshall Solutions for the Electrodeposition of Silver and Nickel" with which it is possible to deposit an alloy of silver and nickel for use on flat-ware, hollow-ware, coffin-hardware and metal novelties. The deposit has the whiteness of silver but with a saving of from 50 to 75 per-cent in cost. The deposit is also harder than silver and does not tarnish as readily. The process is patented and other patents are pending. Samples of work will be done at their plant upon request. Prices, terms and other information will be given upon request.

A branch plant is to be established in Brantford, Canada by the Crown Electrical Mfg. Co., of St. Charles, Ill., manufacturers of electrical specialties.

The Worcester Electric Mfg. Co., of Worcester, Mass., who have been manufacturing electric switches, fuse-blocks, switch-boards, etc., for the past ten years, have now incorporated their company.

The new brass and iron foundry of the Fairview Foundry Co., of Detroit, Mich., at Fairview will soon be ready. A specialty is to be made of brass, bronze and aluminum castings for automobiles.

A new factory for use as a plating and polishing department is to be erected by the Racine Iron & Wire Works of Racine, Wis. It will be 45 x 109 feet and three stories high. Tinning is also to be carried on and wire cloth manufactured.

A new addition to the plant of the Wm. Powell Co., on Spring Grove Ave., Cincinnati, Ohio is being made. The addition is to their brass foundry. This company manufacture high grade steam metal valves and similar goods.

The plant of the Art Metal Works, 9 Market St., Newark, N. J., was destroyed by fire on May 4th. with a loss of $100,000. A line of soft metal novelties, such as ormolu clocks, jewel caskets, trays and other electroplated novelties were manufactured. The plant will be rebuilt and newly equipped.

The Crescent Brass Mfg. Co., has been organized at Cleveland, Ohio to take over the business of L. A. Weber & Co., 2162 East Fourth St., in that city. The manufacture of artistic bronze and brass wares and metal spinning will be carried on. Chas. H. Hofrichter will be the general manager. The capital stock is $10,000.

John H. Robinson, formerly general manager of the Fairfield Aluminum Foundry Corporation of Fairfield, Conn., and who recently served his connection with them, has established a small plant at 45 Dewey Court, Bridgeport, Conn., in which he will manufacture aluminum solder, aluminum castings in metal molds, and later a fine grade of aluminum castings. It is expected that later brass castings will also be made.

With the "Buckeye Parting" or "Okay Parting" made by the Buckeye Products Co. 2306-2312 Wastern Ave., Cincinnati, Ohio, perfect lifts can be obtained with sharp corners and true and seamless castings. While these grades of parting are specialties of the company, an exceptionally full line of foundry supplies are carried as well as specialties used in the foundry trade. Some of these specialties are aluminum-solder, fluxes, litharge, rosin, core-oil, iron-filler, etc., etc. A line of polishing supplies is likewise carried and crocus, emery-cake, tripoli, white-finish, emery and many other materials used in polishing are always carried in stock.

The new plant of the Southern Stove Works at Evansville, Ind., is now in full operation.

The Johnson Service Company of Milwaukee, Wis., have increased their capital stock from $1,000,000 to $1,500,000 and are to commence the manufacture of automobiles.

The Waggoner Watchman's Clock Company of Grand Rapids, Mich., which has been conducted as a firm, has been incorporated with a capital stock of $2,500.

L. E. Garrigus & Co., manufacturing jewelers, have moved from 67 Hamilton St., Newark, N. J., to 38 Crawford St., where larger quarters have been obtained.

The Highland Chemical Products Co., of Connellsville, Pa., are manufacturing a new non-corrosive coating for iron, steel and other metals that is intended particularly to resist the attacks of mine water.

Some very extensive additions are to be made to the plant of the Chicago Brass Company at Kenosha, Wis. This plant is owned by the American Brass Company of Waterbury, Conn., and it is reported that from $1,000,000 to $3,000,000 are to be expended in the improvements.

The Keystone Bronze Company, 39th St., and Allegheny Valley R. R., Pittsburgh, Pa., manufacturers of bronze tuyeres, blast furnace cooling equipment, etc., have purchased a plot of land adjoining their plant and upon which extensions will be made later in the year.

The new office of A. Weiskittel & Sons at their plant in Highlandtown, Md., is nearly completed and will be occupied when done. The present office is at Alliancia and Washington Sts., Baltimore, Md. Plumbers' brass and copper goods are manufactured by this company and they also conduct a brass foundry.

A large addition to the plant of the New Britain Machine Co., New Britain, Conn., is to be made. It will be 60 x 130 feet and five stories high. This company manufactures a large variety of machinery and among which is the Whitney Polishing Jack. This appliance is driven by a belt underneath the pedestal.

George S. Youngs, Housatonic Ave., and Stella St., Bridgeport, Conn., is manufacturing an exceptionally high-grade brass and composition ingot to meet any requirment. He has fitted up a new plant for making the ingot and in which nothing else is made. These ingot metals are made from the best selected chips, previously freed from iron and brought up in melting to the mixture required for the best class of castings. The advantage of ingot metals over miscellaneous scrap in the brass foundry needs no argument as it is not only better but cheaper in the end and insures uniformity. The ingot manufactured by Mr. Youngs has given excellent satisfaction wherever used.

The plant of the Northwestern Copper & Brass Works at St. Paul, Minn., is to be increased later in the year.

The new brick factory of the Baker Lead Company, Cherry St., Worcester, Mass., is now completed. Lead pipe is manufactured.

The North & Judd Mfg. Co., of New Britain, Conn., manufacturers of buckles and saddlery hardware, are to add to their brass foundry by the erection of a new building 60 x 105 feet.

The Waterbury Clock Co., are to commence the manufacture of speed indicators for automobiles. The indicator will be placed on the market by the Cleveland Speed Indicator Co.

The Royal Silver Mfg. Co., 65 Fayette St., Norfolk, Va., job platers, are to shortly enlarge their plant. This company succeeded Nettleton Bros. O. L. Gilbert is the president and general manager.

The Utica Cutlery Co., has been organized in Utica, N. Y., for the manufacture of knives, razors and other lines of cutlery. The capital stock is $50,000 and a large shop has been taken on Hickory St. Operation is to be commenced by July 1st.

The new plant of the J. C. Kupferle at the foot of Wright St., St. Louis, Mo., was formally opened on May 14th. It comprises both brass and iron foundries and the manufacture of plumbers' brass and iron goods is carried on. About 75 hands are employed.

The American Optical Company of Southbridge, Mass., manufacturers of spectacles and other optical goods, are installing two new Diesel engines in their power plant and in which fuel-oil will be used as the source of power.

The name of the Beaton & Bradley Company of New Britain, Conn., manufacturers of floor and ceiling plates and steam specialtiesc, has been changed to the Beaton & Cadwell Company. The capital stock has been increased to $50,000 but no change in the business will be made.

The A. B. C. Castings Company of Cleveland, Ohio, which recently opened their new brass foundry at 6515 Carnegie Ave., in that city are to manufacture a new alloy for the construction of air-ships. It is called "Aerial-Metal" and it has a specific gravity less than that of pure aluminum.

The Lambert & Hamomnd Co., has been organized at Wallingford, Conn., for the manufacture of art metal goods. They are occupying the old Hall & Elton factory opposite the depot and manufacturing has practically been commenced. It is expected that soft metal goods will be made at first, but later a better grade of goods, such as silver deposit wares will be manufactured. Charles O. Lambert, the senior member of the company, was formerly superintendent of the Art Novelty Mfg. Co., of Meriden, Conn.

The Chambers Mfg. Co., has been incorporated at Shelbyville, Ind., with a capital stock of $20,000 to manufacture stoves and heaters.

H. D. Gardner has started in business at 60 Arlington St., Newark, N. J., and will carry on metal spinning, particularly silver spinning.

Geo. H. Thatcher & Co., of Albany, N. Y., iron and brass founders are making some improvements in their plant. A 5 ton travelling crane is being installed, a new core-oven and a new brass melting furnace.

The Norfolk Electroplating Co., 56 Talbot St., Norfolk, Va., who have been conducting a job plating establishment, are about to add the manufacture of jewelry novelties to their line.

The May number of *The Obermayer Bulletin* issued by the S. Obermayer Company of Cincinnati, Ohio., contains some interesting information upon foundry practice and will be sent to anyone who desires a copy.

A new plant 150 x 200 feet, and of brick and steel construction is to be erected by the Crescent Bed Company of New Orleans, La., manufacturers of iron and brass beds. The contract for the steel has been obtained by the Noelke-Richards Iron Co., of Indianapolis, Ind.

The production of metallic cadmium in the United States for the year 1909 was 5,300 lbs., against 10,000 for the year 1908, showing a falling off of 4,700 lbs. This reduction was apparently not caused by a decrease in consumption, but was brought about by importations.

The Union Polish Company, 78-82 Barclay St., New York City, are headquarters for all kinds of compositions used in polishing or buffing. They make a specialty of high-grade rouges for buffing all metals, tripoli and Vienna-lime compositions, all of which will satisfy the most exacting customer.

Thomas Watts Coslett, Temple Courts, Temple Row, Birmingham, England, owner and patentee of the method of rendering iron and steel rust proof called "Coslettizing" wishes to call attention to the fact that both the original and improved process are protected by United States patents. The process, as previously described in THE BRASS WORLD, consists in boiling the iron or steel in a weak solution of phosphoric acid or a solution of phosphate of iron containing phosphoric acid.

The American Tinol Company, 2100 Fairmount Ave., Philadelphia, Pa., are now manufacturing and placing on the market a very useful "Tinol" outfit for soldering. It consists of a soldering blowpipe and Tinol wire and paste so that all kinds of soft soldering can be done without any further equipment. Tinol is a German product and consists of a soft solder containing the necessary flux so that the soldering can be done at once by the simple melting of the solder on the article to be soldered.

A new plant for the manufacture of automobiles is to be built at Frackville, Pa., by the Sprohnle Mfg. Company.

A large addition to the plant of the Racine Aluminum & Brass Foundry of Racine, Wis., is to be made.

Extensions to the plant of the Maxwell-Briscoe Motor Car Company at Newcastle, Ind., are to be of such capacity that 25,000 automobiles will be turned out during 1911.

The Hargreaves Flush Sash Lift Co., has been incorporated in North Adams, Mass., to manufacture a new metal sash lift. It will be supplied in copper, brass, bronze and nickel as well as in japanned and similar finishes.

The National Core-Oil Company of Cornell and Horning, N. Y., manufacturers of compounds for core making, are erecting a new factory in Buffalo, N. Y. It is situated on the Erie R. R. at the foot of Alabama St.

The Eclipse Brass Foundry has been started in Wichita, Kansas to make all kinds of brass, bronze and aluminum castings as well as pattern making. The foundry is located on North Santa Fe Ave., and F. L. Pitts is the general-manager.

The Hopkins & Allen Company of Norwich, Conn., manufacturers of revolvers and similar lines of fire-arms, have purchased the patents, stock and business of the W. H. Davenport Firearms Co., of that city and will manufacture the line in connection with their own.

The Jennings Bros. Mfg. Co., Elm St., Bridgeport, Conn., manufacturers of metal novelties, are getting patterns ready and will shortly start their new brass foundry which has been equipped for making brass art metal goods.

The plant of C. G. Conn Company, the largest manufacturers of brass band instruments in the world, and located in Elkhart, Ind., was destroyed by fire on May 21st. The company operated an extensive electroplating plant and a brass foundry.

The Nelson Valve Company, Chestnut Hill Station, Philadelphia, Pa., manufacturers of bronze valves, have begun the erection of a new steel foundry for making valves and fittings. A new pattern shop and storage building are also to be erected.

Obituary.

Charles A. Tinkham, president of the American Bronze Foundry Co., of Chicago, Ill., died on Apr. 29th, aged 59 years.

Edwin D. Paige, founder and treasurer of the Paige Retort & Crucible Co., of Taunton, Mass., died on May 17th, after a lengthy illness.

J. Frank Dye, president and treasurer of the Newport Sand Bank Company of Newport, Ky., and one of the best known men in the molding sand business, died on May 19th, aged 60 years.

Current Metal and Supply Prices.

These Prices are net and are for moderate quantities. Smaller quantities command higher prices. Prices subject to fluctuation.

Acetone, pure, 98-99%	lb.	.22
Acid, Acetic, pure, 30%	lb.	.07
Acid, Arsenious (White Arsenic)	lb.	.20
Acid, Benzoic	lb.	.55
Acid, Boracic (Boric), pure	lb.	.12
Acid, Hydrochloric, see Acid, Muriatic.		
Acid, Hydrofluoric, 30%	lb.	.04
Acid, Hydrofluoric, 50%	lb.	.10
Acid, Muriatic, 20°	lb.	.02
Acid, Muriatic, c. p., 20°	lb.	.07
Acid, Nitric, 38°	lb.	.05⅝
Acid, Nitric, 40°	lb.	.05⅞
Acid, Nitric, 42°	lb.	.06¼
Acid, Nitric, c. p.,	lb.	.08
Acid, Sulphuric, 66°	lb.	.01¾
Acid, Sulphuric, c. p.	lb.	.06
Alcohol, Wood	gal.	.50
Alcohol, Denatured	gal.	.55
Alum	lb.	.04
Aluminum, Sulphate	lb.	.06
Aluminum, Metallic, in Ingots	lb.	.23
Aqua-Fortis, see Acid, Nitric.		
Ammonia Water (Aqua-Ammonia), 20°	lb.	.04¾
Ammonia Water (Aqua-Ammonia), 26°	lb.	.06¼
Ammonia Water, c. p.	lb.	.08
Ammonium Carbonate, lump	lb.	.15
Ammonium Chloride (Sal-Ammoniac)	lb.	.12
Ammonium Hydrosulphuret	lb.	.30
Ammonium Sulphate	lb.	.07
Ammonium Suphocyanate	lb.	.50
Amyl Acetate	gal.	1.85
Antimony	lb.	.08⅜
Arsenic, Metallic	lb.	.15
Arsenic, White (Acid Arsenious)	lb.	.20
Argols, White (Cream of Tartar)	lb.	.31
Asphaltum, Commercial	lb.	.05
Asphaltum, Egyptian (Bitumen)	lb.	.30
Benzine	gal.	.15
Benzol, Pure	gal.	.75
Bismuth, Metallic	lb.	1.75
Bitumen, see Asphaltum.		
Blue-Vitriol, see Copper Sulphate.		
Borax, Crystals or Powdered	lb.	.10
Borax Glass	lb.	.35
Cadmium, Metallic	lb.	.70
Carbon Bisulphide	lb.	.10
Calcium Carbonate (Precipitated Chalk)	lb	.10
Chrome-Green	lb.	.50
Copper, Lake, (carload)	lb.	.13
Copper, Lake, (cask)	lb.	.13¼
Copper, Electrolytic, (carload)	lb.	.12¾
Copper, Electrolytic, (cask)	lb.	.13
Copper, Casting, (carload)	lb.	.12¾
Copper, Casting, (cask)	lb.	.13
Copper Acetate (Verdigris)	lb.	.35
Copper Carbonate, dry	lb.	.25
Copper Sulphate (Blue-Stone)	lb.	.09
Copperas, see Iron Sulphate.		
Corrosive Sublimate, see Mercury Bichloride.		
Cream-Tartar, see Potassium Bitartarate.		
Cryolite	lb.	.12
Cyanide, see Potassium Cyanide.		
Dextrin	lb.	.15
Emery Flour	lb.	.04
Emery, F F & F F F	lb.	.03
Flint, powdered	lb.	.01
Fluor-Spar	lb.	.01¼
Fusel-Oil	gal.	1.75
Gold Chloride	dwt.	.60
Gum Copal	lb.	.30
Gum Guiacum	lb.	.26
Gum Mastic	lb.	.70
Gum Sandarac	lb.	.35
Gum Shellac, brown	lb.	.50
Gum Shellac, white	lb.	.60
Iron Perchloride	lb.	.25
Iron Sulphate (Copperas)	lb.	.05
Lead Acetate (Sugar of Lead)	lb.	.15
Lead, Pig	lb.	.04½
Lead, Red	lb.	.12
Lead, Yellow Oxide (Litharge)	lb.	.12
Liver of Sulphur, see Potassium Sulphide.		
Manganese, Ferro, 80%	lb.	.10
Manganese, Metallic, pure	lb.	.75
Magnesium, Metallic	lb.	1.50
Mercury Bichloride (Corrosive Sublimate)	lb.	.93
Mercury, Metallic (Quicksilver)	lb.	.50
Mercury Nitrate	lb.	1.50
Mercury Oxide, yellow	lb.	1.80
Nickel and Ammonium Sulphate (Double Salts)	lb.	.16
Nickel Carbonate, dry	lb.	.60
Nickel Chloride	lb.	.50
Nickel Metallic	lb.	.49
Nickel Sulphate (Single Salts)	lb.	.25
Nitre (Saltpetre), see Potassium Nitrate.		
Oil of Vitriol, see Acid, Sulphuric.		
Paraffine	lb.	.15
Phosphorus, yellow	lb.	.40
Phosphorus, red	lb.	1.10
Pitch	lb.	.05
Plaster of Paris, Dental	bbl.	4.00
Platinum Chloride	oz.	14.50
Platinum Metallic	oz.	29.00
Potash-by-Alcohol, in sticks	lb.	.50
Potash, Caustic (Potassium Hydrate)	lb.	.08
Potassium Bichromate	lb.	.14
Potassium Bitartarate (Cream of Tartar)	lb.	.31
Potassium Carbonate (Pearlash)	lb.	.10
Potassium Chlorate	lb.	.15
Potassium Cyanide	lb.	.25
Potassium Iodide	lb.	2.25
Potassium Nitrate (Nitre or Saltpetre)	lb.	.10
Potassium Permanganate	lb.	.17
Potassium, Red Prussiate	lb.	.60
Potassium, Yellow Prussiate	lb.	.24
Potassium Sulphide (Liver of Sulphur)	lb.	.15
Potassium Sulphuret, see Potassium Sulphide.		
Potassium Sulphocyanate	lb.	.70
Pumice, Ground	lb.	.05
Quartz, Powdered	lb.	.01
Rosin, Yellow	lb.	.04
Sal-Ammoniac, see Ammonium Chloride.		
Sal-Soda, see Sodium Carbonate.		
Silver Chloride, dry	oz.	.75
Silver Cyanide	oz.	1.00
Silver, Fine	oz.	.53¾
Silver Nitrate, crystals	oz.	.50
Soda-Ash	lb.	.05
Sodium Biborate, see Borax.		
Sodium Bisulphite	lb.	.15
Sodium Carbonate (Sal-Soda), crystals	lb.	.02
Sodium Hydrate (Caustic Soda)	lb.	.05
Sodium Hydrate (Caustic Soda) by Alcohol (in sticks)	lb.	.45
Sodium Hyposulphite ("Hypo")	lb.	.04
Sodium Metallic	lb.	.90
Sodium Nitrate	lb.	.05
Sodium Phosphate	lb.	.09
Sodium Silicate (Water-Glass)	lb.	.04
Soot, Calcined	lb.	.15
Spelter, see Zinc.		
Sugar of Lead, see Lead Acetate.		
Sulphur (Brimstone) in lump	lb.	.05
Tin Chloride	lb.	.43
Tin, Metallic	lb.	.33¼
Turpentine, Venice	lb.	.35
Verdigris, see Copper Acetate.		
Water, Distilled	gal.	.15
Water-Glass, see Sodium Silicate.		
Wax, Beeswax, yellow	lb.	.45
Wax, Carnauba	lb.	.70
Whiting (Ground Chalk)	lb.	.02
Zinc Carbonate, dry	lb.	.19
Zinc Chloride	lb.	.12
Zinc, Sulphate	lb.	.06
Zinc, (spelter)	lb.	.05½

THE

BRASS WORLD

AND

PLATERS' GUIDE

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devoted to the Art of Refining, Alloying, Casting, Rolling, Founding and Electroplating of all the non-ferrous metals and their alloys.

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Use of the Machine for Testing Hardness in Determining the Temper of Rolled Brass.

One of the most difficult operations in a brass rolling mill is to ascertain the actual "temper" of a sample of brass sheet that is sent in by a customer so that an order may be filled to match it. The size of the sample sent is usually quite small and is rarely over a few inches square. It is so small that about the only method of obtaining the temper is to bend it, scratch it with a knife or submit it to similar crude tests so that the result is more a matter of guess than anything else.

Brass is rolled in many different "tempers", depending upon the use to be made of it. Annealed brass is known as "dead-soft". Other tempers are known as "two numbers hard", "six numbers hard" etc., depending upon the number of thousandths of an inch that the metal is reduced in rolling. The more numbers "hard" the brass is, the greater the actual hardness of the brass so that it is customary to make spring-brass from eight to twelve numbers hard.

It will readily be appreciated, therefore, that if a customer sends in a small piece of brass that has been rolled five numbers hard, the actual ascertaining of this temper is quite a difficult matter in the ordinary way, and, in fact, so much so that if much depends upon the order, a number of samples are made up and sent to the customer to test. It will also be understood, too, that chemical analysis

must be employed as an adjunct to the hardness test for the reason that any specified "numbers hard" in rolling one mixture will not answer for a different one. For example, four numbers hard on a 4 & 1 brass will not begin to harden the metal as though a 2 & 1 mixture were used.

There are a number of different devices now used for testing the hardness of metals. and many concerns are now using them for testing steel. In the brass rolling mill industry they are beginning to be usel, but as yet they have not made much headway. It is quite probable, however, that within a short time, the manner of using these instruments will be better understood and it will be found that in order to compare results identical conditions must be obtained. The hardness is a matter that can be obtained without difficulty, but to be able to use it in establishing the "temper" of a sample of brass, is apparently a matter that needs a little further investigation. It is believed, however, that with persistence and an understanding of the conditions that have to be met, the instrument will finally become a valuable acquisition in the brass rolling mill.

Coloring Yellow Brass Black (Black Brass Dip).

There are two methods in general use for coloring yellow brass black:

1. By means of the ammonia and carbonate of copper dip used *hot.*

2. By copper plating and then oxidizing in a *cold* liver of sulphur solution.

The first method, or that by oxidizing with ammonia and carbonate of copper is quite extensively used on small work and it is more adapted for small than large articles. Unless large articles are treated singly, it is preferable to copper plate them and then oxidize in cold liver of sulphur. Very large articles, too, are best blackened by coppering and treating with liver of sulphur on account of the difficulty of maintaining a large, hot ammonia and carbonate of copper solution.

The second method can be used on all kinds of work, both large and small, but as it means two operations and the use of the ammonia and carbonate of copper necessitates only one, the latter (or ammonia method) is preferable whenever it can be employed.

The ammonia and carbonate of copper dip (also called the "black-brass" dip) frequently bothers a plater, but there is no reason why it should when thoroughly understood. The best method of making it is as follows. Take:

Water	1 gallon
Strongest Ammonia Water .	1 gallon

Place in a stone crock that can be surrounded with hot water to heat it to the necessary temperature. Then dissolve in the solution in the crock, as much carbonate of copper (either dry or plastic) as will be taken up and still have a small quantity left undissolved. *The essential feature of success is to have a little carbonate of copper left undissolved. If it is all dissolved, then the dip will not work well and a black color cannot be produced.* The object is to have the ammonia completely saturated with the carbonate of copper.

While strong ammonia works more rapidly than the dilute, when heated (as the solution must be to have it work) the odor of ammonia gas is too strong for the operator to stand. When the ammonia water is too weak, however, the dip works very slowly.

The solution now obtained by dissolving the carbonate of copper in the ammonia solution is dark blue and slightly turbid from the undissolved carbonate of copper. In order to work well, it must be heated and it will work all the way from 120 degrees F. up. A temperature of about 150 degrees F. is excellent as the dip then works rapidly. Work to be cleaned should be as clean as for plating. The brass takes the color almost immediately. The dip works best on yellow brass and does not give satisfactory results on copper or red metals. The deposit formed will stand a light buffing with a soft wheel, or dry scratch brushing.

Pin-holes in aluminum castings always result from the over-heating of the aluminum during melting.

It has been discovered that if an arc lamp electrode is made of a mixture of metallic molybdenum and metallic iron, or the oxide of molybdenum and metallic iron, a light of great brilliancy is produced. It is also quite white. Excellent results have been obtained with as much as 86 per cent of metallic molybdenum.

Notes on the Foundrymen's Convention at Detroit.

The Foundrymens' Convention at Detroit, Mich. held from June 6—10th. proved to be the most successful and most largely attended of any yet held. This Convention, as perhaps may not generally be known, is conducted by four allied organizations: The Foundry & Manufacturers Supply Association, The American Foundrymens' Association, The American Brass Founders' Association and The Associated Foundry Foremen. The exhibition is conducted by the Foundry & Manufacturers Supply Association who sell space for this purpose. The American Foundrymens' Association is composed of those engaged in the iron and steel foundry trades. The American Brass Founders' Association consists of those interested in the brass industry.

The Convention was held at the Fair Grounds which were admirably adapted for the purpose although so far from the center of the city as to render it inconvenient. The principal portion of the exhibit was held in the permanent buildings at the grounds, but the working furnace exhibit was relegated to a tent about which much dissafaction was expressed on account of the insufficient protection against the rain at the beginning of the week. A number of concerns did not exhibit their furnaces on this account. Manufacturers are now beginning to realize that it is unwise to attempt to melt metal at the convention, and even the running of the furnaces without melting has to be done under trying conditions. Under the circumstances, however, the furnace exhibit was very creditable.

Fig. 1. View of the City of Detroit, Mich., from the Chamber of Commerce Building and Showing the Detroit River.

The headquarters of the Foundry & Manufacturers Supply Association was at the Hotel Cadillac, while the American Foundrymens' Association and American Brass Founders' Association used the Hotel Pontchartrain for this purpose. The meetings were held in one of the buildings at the Fair grounds and the papers were read at that time.

Some of the Exhibits

To the brass founding trade, two classes of exhibits proved of greater interest than the others for the reason that tney were "working exhibits". They were the furnace exhibits and the molding machines.

The Monarch Engineering & Mfg. Co., of Baltimore, Md., had a full line of their melting and heating furnaces in operation. Among the new products of the company shown for the first time, was one of their core-ovens in which the waste heat from a melting furnace is used. All of their furnaces were in continuous operation during the week.

The Anthony Company of New York had in operation one of their new melting furnaces supplied with their low pressure burner, demonstrating how metal can be melted with oil without appreciable noise. Metal was melted in the furnace and poured into molds in order to show its full value and demonstrate to visitors the ease of working.

J. B. Wise of Watertown N. Y., exhibited the M. R. V. furnace in which coke is used for the fuel and the crucible is not removed from the furnace during the pouring. Although metal was not melted during the Convention, the furnace was in operation in order to illustrate the manner of working.

The Hauck Mfg. Co., of Brooklyn, N. Y., showed their full line of oil burners for mold drying, heating, brazing, heating etc. and which were maintained in operation during the entire period.

The Hawley Down Draft Furnace Co. of Chicago, Ill., had a still exhibit of their line of oil and coke furnaces.

The Kroeschell Bros. Co., of Chicago, Ill., also had a still exhibit of their crucible furnaces, ladle heaters and stoves.

The Rockwell Furnace Co., of New York City maintained a booth in which photographs, blue prints etc., were shown but they did not exhibit furnaces.

The Metal Dross Economy Co., of Bristol, Conn., exhibited their skimming tank and recovery cabinet for reclaiming the metal from brass foundry skimmings. A line of samples of the different classes of materials obtained from their tank were also shown illustrating the great economy of the process.

The molding machines in operation attracted much attention and manufacturers of these machines are to be commended for their foresight in the matter. It serves to illustrate to the prospective user the good points of the machines so that he can readily understand their principles. The following molding machines were exhibited:

Fig. 2. The Pontchartrain Hotel, the Headquarters of the American Foundrymen and American Brass Founders' Association.

The Tabor Mfg. Co., of Philadelphia, Pa., showed a full line of their power squeezing machines, roll-over machines, and the various types of jarring machines which they make. They were awarded the silver cup by *The Foundry* for the best working exhibit at the Convention.

The Mumford Molding Machine Co. of New York City showed a working exhibit of their various kinds of machines.

Henry E. Pridmore of Chicago, Ill., had on exhibition a complete line of the numerous types of molding machines which he manufactures.

The Adams Company of Dubuque, Iowa, The Arcade Mfg. Co., of Freeport, Ill., The Berkshire Mfg. Co., of Cleveland, Ohio, A. Buch's Sons. of Elizabethtown, Pa., The Herman Pneumatic Molding Machine Co., of Pittsburg, and E. Killing's Molding Machine Works of Davenport, Iowa all showed creditable working exhibits illustrating the different types of machine which they make.

Only two crucible concerns had exhibits: The Joseph Dixon Crucible Co. of Jersey City, N. J., and the Jonathan Bartley Crucible Co., of Trenton, N. J. Both companies showed a full line of their products.

The foundry supply trade was extensively represented and really showed the most painstaking exhibits. The S. Obermayer Company of Cincinnati, Ohio had their usual creditable exhibit and representation. The J. W. Paxson Company of Philadelphia, Pa., had their booth very creditably arranged with their products and a very complete line of foundry equipment was displayed.

The Michigan Smelting & Refining Co., of Detroit had the most extensive exhibit of metals and a large variety of castings made from their ingot metals were shown. The Buckeye Products Co., of Cincinnati, Ohio showed a line of brass fluxes, partings, specialties and supplies. The Foundry Specialty Co., of Cincinnati, Ohio also exhibited a full line of their goods such as parting compounds, fluxes and specialties.

A large number of other exhibits were shown, many of which were of interest only to the iron and steel trades, while others were intended for both iron and brass foundries. It is to be regretted that lack of space is responsible for not giving a detailed list of the remainder of the exhibitors.

Fig. 3. Hotel Cadillac, the Headquarters of the Foundry & Manufacturers Supply Association.

The election of officers of the various associations for the coming year resulted as follows:

Foundry & Manufacturers Supply Association

President, George R. Rayner of the Carbo-

rundum Co., Niagara Falls, N. Y.; first vice-president, Wilfred Lewis of the Tabor Mfg. Company of Philadelphia, Pa.; second vice-president, E. D. Frohman, the S. Obermayer Co., Pittsburg; third vice-president, S. T. Hammond, the Whiting Foundry Equipment Co., Harvey, Ill.; fourth vice-president, Harry D. Gates, the Thos. W. Pangborn Co., New York. For trustees to serve three years, F. N. Perkins, the Arcade Mfg. Co., Freeport, Ill.; H. M. Bougher, the J. W. Paxson Co., Philadelphia, and E. H. Steedman, of Curtis & Co. Mfg. Co., St. Louis; for secretary, C. E. Hoyt, Lewis Institute, Chicago, and for treasurer, J. S. McCormick, the J. C. McCormick Co., Pittsburg.

American Brass Founders' Association.

President, N. K. B. Patch of the Lumen Bearing Co., Toronto, Canada; vice-presidents, Thos. Evans of the Eynon-Evans Co., Philadelphia, Pa.; J. Cessna Sharpe of the J. C. Sharpe Brass Works, Chattanoga, Tenn.; W. L. Abate of the Nathan Mfg. Co., New York City; W. H. Carpenter of the Bristol Brass Co,. Bristol, Conn.; Richard Augenbraun of the Yale & Towne Mfg. Co., Stamford, Conn.; L. M. Olsen of the Ohio Brass Company, Mansfield, Ohio; John Wolff of the L. Wolff Mfg. Company of Chicago, Ill; J. N. Gamble of the National Tube Co. of Kewanee, Ill.; Murray Woodbridge of the General Brass Works, Toronto, Canada and Richard R. Mitchell of the Robert Mitchell Co., Ltd., Montreal, Canada.

Secretary and Treasurer, W. M. Corse of the Lumen Bearing Co., of Buffalo, N. Y.

The report of the treasurer showed that the Association now has a membership of 273, a gain of 67 members since the Cincinnati Convention.

American Foundrymens' Association

President, J. T. Spear of the Pittsburg Valve, Foundry & Construction Co., Pittsburg, Pa.

Vice-Presidents, F. B. Farnsworth, Walter Wood, W. A. Bole, William Gilbert, J. J. Wilson, T. W. Sheriff, Alfred E. Howell and N. W .Clare.

Secretary and Treasurer, Dr. Richard Moldenke of Watchung, N. J.

The next Convention will be held in Pittsburg, Pa., and from indications it is believed that it will be the most largely attended of any yet held.

Some of the papers read at the meeting are as follows:

The Shockless Jarring Machine.*

By Wilfred Lewis.†

The jarring machine is essentially a sand packing machine, capable of ramming any mold, large or small, in a minute or less time, and by the method employed, the sand is rammed as it should be, densest at the surface of the pattern and of decreasing density above, thus favoring the escape of gases when the mold is poured. The packing of the sand results from impact between the table on which the mold is carried, and the anvil on which it drops; and in operation, various means may be used to lift the table and let it drop, but in foundry work compressed air has come to be generally preferred for its convenience as a medium for the transmission of power, and also for the simplicity of the machines resulting from its use. The jarring machine is not universal in its application, nor should it be used without judgment and discrimination. Due regard must be given the construction of the pattern, so as to permit a flow of sand chiefly in one direction, and to withstand successfully the shock of impact in ramming. For the broad field of work adapted for its use, there is nothing comparable to the jarring machine as a saver of time and money.

Jarring machines have been in practical use for many years, without attracting much attention, and the records of the patent office go back to 1869; but like all other types of molding machines they have never been made, until quite recently, for large work beyond the strength of one or two men to handle. It was quite natural that the molding machine should begin its development in a small way, on small work, and gradually extend its field of usefulness to larger and heavier molds.

Any one who has watched a bench molder fill his little flask, ram it in a few seconds with a butt rammer in each hand, then roll

*Abstract of a paper read at the meeting of the American Foundrymens' Association held in Detroit, June 6—10, 1910.

†The Tabor Mfg. Co., Philadelphia, Pa.

over and draw the pattern with the dexterity of an artist in legerdemain, can appreciate the difficulty of helping him in his work by any mechanical means. And yet the old-fashioned hand squeezer saved some of the ramming time, the power squeezer saved a little more, but not so much as in the strength of the operator, keeping him fresh with steady hand and eye for the delicate work of drawing patterns and setting cores.

Fig. 4. West Grand Circus Park, Detroit, Mich., with Hotel Tuller in the Background.

limited in its application to what can be done at one effort by one man, and for larger work,

Pattern guides were then devised to assist in drawing patterns and vibrators were invented to free the pattern from the sand without appreciably enlarging the mold.

The use of molding machines on small work has resulted in a substantial saving in the cost of molding, less wear and tear on patterns and greater uniformity in castings, the saving in weight of the castings due to the use of a vibrator being sometimes an item that soon pays for the installation of machines. The hand squeezer is, of course, power squeezers have generally been employed, but when large molds are squeezed by power, more or less trouble has been encountered in the distribution of pressure on the sand and at one time an effort was made to overcome this difficulty by means of a water-bag, placed between the sand and the squeezing head. Better results were obtained, however, by judicious tucking in deep pockets and by heaping the sand over deep places and scooping it out over high points in the pattern, but the main difficulty in squeezing deep molds lies in the fact that the sand is generally moved against the pattern, instead of the pattern against the sand. This results in the greatest density of sand, not where it should be next to the pattern, but away from the pattern next to the squeezing head, and as shown by Harris Tabor's experiments, which were presented to the American Society of

Mechanical Engineers in 1892, the friction of sand on the sides of a deep flask may carry a large part of the pressure on the squeezing head. To avoid this difficulty, bottom ramming machines have been employed which move the pattern against the sand, but this method contemplates a definite predetermined movement of the pattern to produce a mold of the density desired, and it is subject to variations not easily controlled. Bottom ramming has, therefore, not been adopted to any great extent, and power squeezers have been limited in sizes to flasks not often more than 2 or 3 feet on a side by a foot deep. Such machines, when designed also for pattern drawing, are comparatively expensive, and they marked for a time the limitations of machine molding.

During recent years, however, while the power squeezer and the split pattern machine were completing their development, the much neglected jarring machine has grown steadily in favor and in size until to-day there would seem to be no limit to its capacity. These machines are simple in construction and effective in operation, while on large work the saving to be effected by their use probably exceeds that of all other types of molding machines combined. I say on large work, because on small work jarring machines cannot compete with power squeezers of the same capacity, except perhaps in a few special cases where the work is deep.

The value of any machine depends, of course, on what it can save and what it costs to effect that saving, and this is a problem to be worked out in every instance by a systematic time study of all the operations embodied in producing a given result. For instance, if it takes two men eight hours to mold by hand a certain pattern in a flask 45in. x 60in. x 36in., and if five hours of this time are consumed in ramming sand, a jarring machine would save practically five hours of that ramming time. It would not save any of the pattern drawing and finishing time, nor any of the time for setting cores, but it would enable two men to make the mold in three hours instead of eight hours by hand, hence with a suitable jarring machine, two men could put up 2.67 times as much work as by hand.

In this case the jarring machine saves more than half of the molding time, and it is, therefore, the most important help in the reduction of cost, but when patterns are rapped with a sledge and drawn with a crane or hoist, a great deal of the molder's time may be taken up in finishing, or, to put it more bluntly, in repairing the damage done to the mold by this brutal way of rapping and drawing the pattern. Assuming that about one hour might be spent in finishing each half mold when made by hand, an effective pattern drawing machine could easily save two hours, and with such a machine, it is evident that two men could make a mold in six hours, thus increasing their rate of molding 1.33 times that done by hand. By means of a sand conveyor or even a clam-shell bucket on a travelling crane, perhaps 30 minutes could be saved, thus enabling two men to make the mold in 7 hrs. 30 min. and with this device only they could make their rate of molding 1.067 times as fast as by hand.

For the purpose of illustrating the advantages of co-operation or concentrated effort upon any given piece of work, let us now assume that the demand for the castings, above referred to, has resulted in the making of three sets of patterns, and that we have three sets of men at work making three molds a day by hand. Now suppose we give one set of men a jarring machine, another set a pattern drawing machine and the third set a sand conveyor.

Production in 8 hours.

First set of men ..... 2.67 molds
Second set of men ..... 1.33 molds
Third set of men ..... 1.067 molds

Six men with three patterns will produce 5.067 molds in 8 hours instead of three molds by hands, or about 1.7 time as much work.

On the other hand, if we have but one pattern and one set of men, and give them the combined help of a jarring machine, a pattern drawing machine and a sand conveyor, two men will save 5 hours in ramming time, 2 hours in finishing time, and half an hour in shoveling sand, or 7½ hours in all, bringing the time down on one mold from 8 hours to 30 minutes, and increasing the production 16 times.

So much for the savings to be effected. On the other hand, the interest on the investment, the depreciation of the machine, and the consumption of power must be accounted for, and in addition to all these the damage may be caused by the action of the jarring machine upon finished molds, or even upon build-

ings in the neighborhood, and the annoyance caused by noise and ground waves generally. This damage and annoyance have increased steadily with the increase in the weight of the loaded table, and to meet these serious objections, various expedients have been adopted, among which may be mentioned a reduction in the stroke or drop given, and a more or less resilient bedding for the anvil.

These palliatives, however, left much to be desired, until the shockless jarring machine with its uprising anvil to meet the falling table was developed. It has eliminated the chief objection to jarring machines, and it is power is concerned, and that under certain conditions the efficiency may be reduced to zero. In the process of ramming, the density of sand is increased 25 or 30 per cent, and if a steam indicator were attached to the cylinder of a power squeezer, it may be questioned whether the work actually done on the sand in squeezing it to the proper density would ever exceed 1000 lbs. per cubic foot. Of course, a great deal more power than this would be consumed in the use of water or air as a working fluid, but the work put into the sand would in all probability not exceed 1000 lbs. per cubic foot.

Fig. 5. Owen Park and the Detroit River.

the object of this paper to elucidate the principles upon which it works and to establish its superior claim to efficiency.

In the first place it must be admitted that, although the packing of sand by the jarring process is very effective in producing results, it is not very efficient under the most favorable conditions as far as the expenditure of

To produce the same effect by jarring, the sand might be raised to a height of 4 inches and dropped upon an anvil thirty times, but, in addition to the weight of the sand, must be added the weight of the table, flask and excess sand to aid in ramming. The first blow struck will cause the greatest flow of sand, and will do the most work upon it, while each

succeeding blow will increase the density and do less and less work until, after a certain number of blows, the sand will remain at a density corresponding to the drop, and when this point has been reached, the continued action of the jarring machine simply wastes power and produces no effect. The jarring machine is, therefore, more efficient during the earlier stages of the process than it can be when the condition of maximum density is approached, and for this reason the longer the stroke, the greater the efficiency, but other considerations of a practical nature affecting the elasticity or durability of flasks, patterns and the machine itself, necessarily tend to limit the stroke, so that in practice it varies from ⅜ inch on some machines to 4 inches or more on others with an average of perhaps 2½ inches.

In such machines, the most important consideration is solidity of construction and freedom from vibration in the jarring table. Otherwise the sand will become broken or laminated in character and the mold will be liable to fall apart in handling. Although lightness of construction in the jarring table is obviously desirable from the standpoint of economy in power, it is certainly not desirable from the standpoint of making perfect molds. The good results which accompany the stronger and stiffer table, really cost less and consume less power in the end, because there are no failures to be repeated nor molds to be thrown away. The importance of solidity in the jarring table will be appreciated from a consideration of the character of rammed sand. It has a certain amount of resistance to further compression and some tensile strength which, of course, is easily overcome. There must, therefore, be no movement between the pattern, sand and flask, tending to pull the sand apart, of sufficient amplitude to cause fracture, and no lateral movement tending to slide one layer of sand over another. Such fracture or lamination may be caused by badly fitted pattern boards, flimsy patterns or crooked flasks not properly bedded, but a light and flimsy jarring table that can be easily warped out of shape will augment the difficulty, and effectually prevent the success of good patterns carefully mounted in strong and firmly bedded flasks.

The shockless jarring machine consists in its usual form of a jarring table mounted upon an upstanding plunger forming the anvil, which in turn is mounted in a cylinder base and supported upon long helical steel springs. Compressed air, as the working fluid, is admitted through an automatic valve, under hand control attached to the plunger or anvil base, and this passes first into the jarring cylinder to raise the loaded table. At some predetermined point in the table movement, the air is automatically cut off from the cylinder, and while the valve is reversing, the confined air will expand and lift the table further from its anvil, if its initial pressure exceeds the balancing pressure due to the weight carried. Then, when the operating valve completes its reverse movement, the air from the jarring cylinder may be exhausted into the atmosphere, but preferably it passes from the jarring cylinder to the anvil cylinder beneath, and the table drops by gravity against the reduced pressure in its cylinder. At the same time the plunger base or anvil is relieved of a considerable part of the load carried by its supporting springs, which immediately expand, giving the anvil an upward velocity to meet the falling table. When air is expanded from the jarring cylinder into the anvil cylinder, this upward velocity of the anvil is augmented, and the falling velocity of the table is somewhat retarded, but in any case the momentum of the rising anvil is substantially equal to that of the falling table at the instant of impact, and as a result both table and anvil come to rest with great jarring or ramming effect upon the sand, but without shock or jar upon the foundation or any surrounding material.

When the air from the jarring cylinder is discharged at once into the atmosphere the momentum of the falling table may somewhat exceed that of the rising anvil at the instant of impact, but when this air is expanded into the anvil cylinder, it compensates more or less for the loss of spring pressure, as the anvil rises, and in this case the momentum of the rising anvil may exceed that of the falling table at the instant of impact. The difference, however, need not be very pronounced, and it simply results in a slight initial velocity of the table and anvil at the beginning of the next stroke. The advantage of the second expansion is two-fold: it utilizes the potential energy of the compressed air in augmenting the momentum of the anvil and at the same time it checks the acceleration of the table due to gravity, and holds it in contact with

the load upon it while falling. Otherwise a poorly fitted pattern board or flask may tend to spring away from its support while falling, and cause lost motion productive of a bad mold. For the same purpose, when the air is discharged directly from the jarring cylinder, long compression springs between the jarring cylinder and its plunger may be introduced with good effect. They assist in lifting the loaded table and retard its acceleration in falling, and by their use the lifting capacity of jarring tables may be considerably augmented. Their chief purpose, however, is to retard the falling table and hold the pattern flask and sand firmly against it in readiness for the coming blow. With such a spring, the action of the table is, of course, somewhat slower in falling and more stroke is required to produce a given velocity of impact. On the other hand, the table rises faster and runs further to produce a given blow and the increased stroke reduces the percentage of clearance space to plunger displacement. The spring in this position has, therefore, some beneficial effect upon the consumption of power, while serving a much better purpose in the production of good molds, and although this spring is not so important when the air from the jarring cylinder passes through the anvil cylinder, it may still be of some value in that case also.

The valve mechanism and the means by which it is controlled do not particularly concern the present discussion, and it will suffice to say that the machine is started and stopped by an operating lever which controls the admission of air to the automatic mechanism. So long as this lever is held down, the machine will run automatically, and when released the machine will stop. A latched lever is arranged to adjust the stroke, which can be varied while the machine is running. A safety stop is also provided to limit the table movement through the action of the main valve attached to the plunger base. When pressure is admitted to the jarring cylinder, the anvil cylinder opens to exhaust, and while in action the latter descends while the table is rising, and then rises to meet the falling table. This action has been very aptly described as "libratory" and at one time "The Libratory Jarring Machine" was considered as an appropriate title for the machine under discussion, which was finally called the "shockless."

Fluxes as Applied to the Brass Foundry.*

By Erwin S. Sperry.

In the early days of brass founding, two things were guarded jealously: The mixtures and the fluxes. At that time it was not an uncommon occurrence to hear one say, when speaking of a new proprietor of a brass foundry, "He will get along all right. His father left him all his formulas for mixtures and fluxes." It seemed to be taken for granted that even capital itself was subsidiary to these heirlooms. Soon the chemist began to make serious inroads into the mixtures and their secrecy faded away gradually but surely. The mystery of the fluxes was more difficult to eliminate, as unlike the castings themselves, they did not go beyond the foundry. They could not be analyzed without obtaining at least a small quantity, and this was difficult to do as the brass founder carefully guarded them and the materials from which they were made. In the course of time, however, the secret of the fluxes went the way of the brass mixtures so that by the process of evolution, "secrets" finally became general technical knowledge. Few brass founders are now found who claim to have anything original or remarkable in the flux line.

When fluxes are mentioned, it is frequently asked: What is their advantage, and are they really necessary? To answer this question I will say that I believe the flux question is greatly overdone and likewise imperfectly understood. It was only a short time ago that I discovered a brass founder using lime in making an 88—10—2 mixture from new metals. He said "somebody" had told him that it was good for bronze. Although cheap substance that it is, he was wasting his lime as it remained on the metal like so much dirt and had no more effect than sand. In another instance I found that a brass ingot maker used a couple of handfuls of a mixture of common salt and borax on the top of a pot of yellow brass after it had been skimmed and immediately before pouring. The mixture was thrown on and at once skimmed off

*A paper read at the meeting of the American Brass Founders' Association held in Detroit, Mich. June 6-10, 1910.

without waiting for the borax to even stop swelling. He too would have been equally as well off without the flux. Another, but diametrically opposite case, was a brass founder who attempted to melt his emery grindings in a crucible without flux and obtained about a pint of metal and a half a bushel of dross. In this case a flux was needed.

It will hardly be advisable to go into a detailed enumeration of all the fluxes known to mankind and which can be used in brass melting as it would be of little value. Many substances once used for this purpose have now become obselete and many others have proved to be valueless. It seems preferable, therefore, to give a description of those fluxes that the test of time has proved valuable and the manner in which they should be used.

Flux for Aluminum

For years those who melted aluminum used no fluxes at all on it, not even charcoal, as it was soon found that this material did more harm than good. On account of the lightness of aluminum, charcoal does not readily free itself and is apt to become entangled in the metal and produce small, black spots in the casting. It is only within the last few years that a flux has been used.

For aluminum, the flux that is most extensively used, and which has proved to be so valuable is *chloride of zinc*. It seems to react with the aluminum, forming chloride of aluminum and metallic zinc which alloys with the aluminum. When this takes place, the dross is changed to a fine, granulated condition which is readily skimmed off. When aluminum is melted, the surface is covered with a rather thick mass, but the chloride of zinc will change it to a perfectly clear one closely resembling in appearance molten tin or lead. It is needless to say that such clean metal gives better castings.

The method of using chloride of zinc as a flux in melting aluminum is simple. Small pieces are thrown on the surface after the melting has been completed. Enough has been added when the surface is clear. A very small amount usually suffices and for 50lbs. of aluminum a piece the size of a walnut is generally enough. The metal is stirred immediately after the addition and then skimmed. Those who have not used chloride of zinc should try it as it is an excellent material.

Flux for Nickel.

The flux used by makers of nickel anodes has proved to be a good one. It was first used by A. M. Hill of New Haven, Conn., one of the first in the United States to make nickel anodes and the inventor of the well known "Hill-Barrel" for grinding brass furnace ashes. Mr. Hill has retired from the anode business, but for many years he used this flux with the best of results. It is not only good but cheap. It is composed of the following:

Lime	3 parts
Fluor-Spar	1 part

The manner of making it is to take the lime and slake it as though mortar is to be made. Then stir in the fluor-spar and allow to become solid. It is then broken up into small pieces for use.

While fluor-spar alone is a good flux, it becomes very fluid when melted and rapidly attacks the crucible. I have seen a new plumbago crucible ruined in one heat when fluor-spar was used alone. It seemed to soak in and dissolve out the clay from the crucible mixture and leave nothing but the graphite. The crucible collapsed like an egg shell when grasped with the tongs. The use of the lime with the fluor-spar is to increase the melting point so that it will not readily attack the crucible. The proportions previously mentioned have been found satisfactory for nickel. Less lime will render it more fusible.

This flux has been found particularly serviceable in melting old nickel anodes as it dissolves out any earthy matter which may be on them. It is used for both old and new material, however, and may be called the standard flux for nickel. The proportions used are about a pint or a good handful for new nickel, and twice as much for old material.

It must not be imagined, because fluor-spar is toned down with lime, that the flux will not act on the crucible for it certainly will. In this connection it should be borne in mind that all fluxes act on the crucible to a greater or less extent, otherwise they would not be of value as a flux.

Flux for Copper.

There probably have been more fluxes proposed or used for copper than any other one metal or its alloys. The fact that copper cannot be melted alone and obtain sound castings from it has brought about this fact.

Practically every known chemical has been tried. In the selection of a flux for copper, it should be known whether pure copper castings are to be made, or whether the copper is to be alloyed to make brass or bronze.

To make sound copper castings with a flux alone, and without the use of "physic" like silicon-copper, magnesium or similar materials (which are, strictly speaking, not fluxes) is a difficult matter. For this purpose, I have found that *yellow prussiate of potash* (potassium ferrocyanide) is excellent. With it sound copper castings may be made, but I do not advise its use as far better results may

Fig. 6. Glimpse of the Detroit River.

be obtained by the usual deoxidizing agents, such as silicon-copper, magnesium, phosphorus etc.

In melting copper for producing brass or bronze, the question is different from the preceding one. For this purpose there is nothing better than *common salt.* Its value lies in the fact that it possesses the property of reducing any oxide of copper which may form during the melting. It has been used for years in the brass industry and the memory of the "oldest inhabitant" fails to indicate the date of its inception.

Common-salt is so efficacious in reducing oxide of copper that as far back as 1882, R. Monger in the *Chemical News* proposed it as a means for determining the quantity of oxide which copper contains. His method was to melt salt in a clay cruicible, and then drop in the weighed sample of copper. After allowing to remain for a short time, the crucible was cooled and broken when a button of pure copper was obtained. The difference in weight gave the amount of oxygen (or its equivalent oxide of copper). Some very satisfactory results were obtained.

In melting the copper for making brass or bronze, about a handful of common-salt is used and is preferably put in after the copper has begun to melt. If introduced with the copper, it melts before it and is apt to volatilize and waste. The action on the

crucible is also greater. Too much salt produces a liquid that is apt to penetrate the crucible like fluor-spar although not as violently or as rapidly. The amount of salt previously given is used for a pot of metal holding about 150 lbs. The quantity need not be exact as a variation either way does no harm as long as sufficient quantity is used to do the work.

The theory of the action of the common salt seems to be that at the temperature of the molten copper, it breaks up or dissociates into metallic sodium and chlorine gas. The latter escapes and the sodium performs its work in deoxidizing.

Flux for Brass.

The flux almost universally and exclusively employed in brass melting is *common-salt.* As previously mentioned, its action is to reduce the oxide of copper formed in melting the copper previous to the addition to the spelter. The brass rolling mills in the Naugatuck Valley, Connecticut, and elsewhere as well, all use it, and one large company uses approximately half a ton a day. It is the universal and *only* flux used in making brass for rolling. For years it has been employed for this purpose and in my own remembrance always has been. It seems to give all that is desired and has the distinct advantage of being cheap. Any kind of common-salt will answer and a pure material is unnecessary.

The quantity used is about a handful to the crucible containing about 150 lbs. of brass. One concern uses one handful, while another believes that double this quantity should be used. A good sized handful, however, seems to be sufficient. It is added after the copper begins to melt as this appears to be the best time to introduce it. When the right conditions have been produced, there will be little slag on the brass when it is skimmed.

It is worthy of note that, although every brass rolling mill uses salt in brass melting, few brass founders who make sand castings employ it. Many of them have never heard of it and others seem to think that it is a waste of time and money to employ it. I advocate its use under all conditions, and as it is theoretically correct, has been found by actual practice to improve the quality of the brass, and is so cheap that the cost of the brass is not appreciably increased, it seems to me that every brass founder should use it, whether he makes new metal or melts scrap as the character of his castings will be improved.

Flux for Bronze or Composition.

What has been said about the use of common-salt in melting yellow-brass, applies equally well to composition or bronze and it is used in identically the same manner and in the same quantities. It makes no difference whether phosphorus or other deoxidizing agents are employed, salt is used just the same.

Flux for German-Silver.

German-silver is such a refractory material in the rolling mill that much time and thought have been given the subject of a suitable flux for it. It is a singular fact that the bulk of the German-silver manufactured in the United States is made by two concerns. One uses a flux in making it, while the other uses none. In justice to the concern which uses no flux at all, I will say that their German-silver has a little better reputation and they have the most particular trade. I cite these examples simply to indicate that fluxes do not constitute the "secret" of making German-silver by any means.

The use of a flux by the other concern dates back to 1869 when Frederick Wilcox of Waterbury, Conn., a brass caster engaged in the manufacture of German-silver, had trouble with black, minute spots in his metal. Tradition states that he gave the matter much thought and finally believed it to be caused by the presence of carbon in the metal. Further "thought" indicated to him that the only method of removing it was to use a nitrate of some kind which would evolve oxygen and oxidize the carbon. Nitrate of soda was, therefore, used and upon its use in German-silver he obtained a patent (U. S. Patent No. 96,524, Nov. 2nd. 1869). As this material was found to work better with black oxide of manganese, the two were afterwards used together and now constitute this flux of the aforesaid concern.

Personally I doubt whether this flux has much value, and the fact that it is possible to make good German-silver without it would seem to indicate it. I feel quite sure that there is no oxidation of carbon, as nitrate of soda, when allowed to melt on copper, will not oxidize it but instead will actually render

it sounder. It is also a singular fact, which I have already demonstrated in practice, that a mixture of nitrate of soda or the nitrate of potash (nitre), mixed with black oxide of manganese and used as a flux on copper, will actually introduce metallic manganese into the copper, showing that there is a reducing action. This explains, I believe, the reason for the action of the flux. A slight amount of manganese is introduced. It is also borne out by the fact that, within the last few years, metallic manganese has come into use as a deoxidizing agent for German-silver and similar nickel alloys. Its use is preferable to introducing manganese through the agency of a flux, as the results are then positive and certain and a pre-determined amount of manganese can always be added. The use of manganese for this purpose has been attended with excellent results, and it seems to be the natural deoxidizing agent for nickel and nickel alloys.

In making German-silver, common-salt is used in the same manner and with the same results as those obtained in brass and bronze.

Flux for Washings, Grindings etc.

In the melting of the washings from the reclaiming of brass foundry ashes, a flux must be used in the majority of instances unless they have been washed very clean and this is rarely done. Even with clean washings it is advisable. The same rule applies to grindings skimmings and similar waste materials. Unless a flux is used when they are melted, a union of the particles of metal is prevented by the presence of so much foreign matter, and instead of fluid metal there is usually obtained a small quantity in the bottom of the crucible and a large mass of pasty material fritted together. When a flux is used, the foreign matter is dissolved and clean metal left.

For use in melting brass, bronze or composition washings, grindings, skimmings and similar material, I have found nothing bet-

Fig. 7. Daily Excursions on the River with Steamboats Ready for the Start.

ter than *plaster of Paris*.. It is a cheap and excellent flux for this purpose. How far back it was used for this purpose I cannot say, but it was first called to my attention by the late C. S. Moore. With due respect to him, I believe he can really be called the "father" of the present scrap metal industry in the United States as he was responsible for many innovations (such as the "transmutation" of yellow washings into red) and I firmly believe he was the first to use plaster of Paris as a flux. He informed me to this effect and I have no reason to doubt his word.

The value of plaster of Paris as a flux in melting washings, grindings and similar material is that it possesses the property of dissolving what foreign matter may be present in the shape of sand, slag or oxide and it has practically no action on the crucible. In addition it is quite cheap. On account of the fact that it has little action on the crucible, any desired quantity can be used. It melts readily and forms a thin slag.

To melt washings or grindings with plaster of Paris, mix about 5 lbs. of it with each 100 lbs of the washings when they are placed in the crucible. Then melt in the usual manner. If the slag at the conclusion of the melt is not sufficiently fluid, more should be added. When the metal is completely melted, pour the entire contents of the crucible into the ingot molds. *Do not attempt to skim it.* It is unnecessary. The slag will run into the molds with the metal and rise to the top. Allow the mass to cool and then dump the ingot molds. The plaster of Paris slag can then readily be detached by a blow from a hammer, or it frequently will fall off under normal conditions. If desired, it may be used over again. It will be found a very satisfactory flux for this purpose.

Plaster of Paris is calcium sulphate, and when used as a flux, the action seems to be one of simple solution. The molten mass dissolves the foreign matter as sugar is dissolved by water.

When coal is present in the washings (as it usually is) there is a slight reduction of the calcium sulphate to sulphide and an odor of sulphur will be noticed during the melting. This seems to do no harm and I have never been able to find that it directly injures the metal. In fact, it appears to act in an opposite manner, and any iron that may be present is changed to sulphide and enters the slag. I have always advocated the use of plaster of Paris in melting scrap materials containing iron, and have invariably found it to be followed by good results.

Necessity of Charcoal.

I have made no previous mention of the use of charcoal for the reason that it is not properly a flux, although it takes the place of one. I can say without hesitation that charcoal should be used as a covering in melting all metals previously enumerated except aluminum. Its value lies in the fact that in burning it supplies a reducing atmosphere and thus prevents the oxidation of the molten metal. At the same time it covers the metal and prevents the products of combustion from coming in contact with it. It is free from sulphur which renders it the ideal material for this purpose. It should be coarsely granulated and not powdered so as to allow its covering the metal completely without danger of immediate combustion. Fine coke and coal, although frequently used, are much inferior to charcoal as they contain more or less sulphur which injures fine grades of metal.

Uses and Prices of Platinum, Palladium and Iridium.

Platinum has been steadily advancing since last September, and today is worth fully $5 per oz. more than during the latter part of 1909. In small lots, ingot metal cannot be bought for less than $29 per oz., but in large lots it is obtainable at $28.50 @ 28.75. Advices from abroad indicate that the price for this metal will continue to advance for some time to come.

Palladium can be purchased at $31 @ 32 per oz., but iridium is simply "out of sight." There is very little of this metal on the market, and for what can be had as high as $50 per oz. must be paid. The holders do not seem to be particularly anxious to part with it even at that figure. Iridium has never been sought for to any great extent until during the last year, when the electrical concerns and automobile manufacturers began using it for sparking points. Jewelers are also using large quantities of it for the setting of precious stones.—*Engineering and Mining Journal.*

The Production of the "Heat-Black Finish" on Brass, Bronze and Copper.

The so-called "heat-black" finish on brass, copper or bronze is one of the new methods of coloring metals that has recently appeared and is one of the most durable. It is adapted for a large variety of work and is even replacing nickel plated work for some kinds of articles. Desk telephones, such as that herewith illustrated, are now being finished in the "heat-black", and in many parts of the United States are supplanting the nickel plated article previously used.

The adaptability of the "heat-black" is large and the reader will undoubtedly find many new uses for it. The color is an absolute dead black, and as it is not difficult to apply, the future will undoubtedly find it extensively employed. It can be applied to brass, bronze or copper. It does not work evenly on steel or iron.

The article to be treated should be free from grease, although a slight tarnish does no harm. It is usually customary to sand blast the surface although very good results may be produced without it. A sand-blasted surface takes an excellent finish, but those who do not possess the apparatus for producing it need not have any hesitation about using the finish as about the only difference between the results is that the sand-blasted surface is a little more dead.

The Solutions.

Two stock solutions are first made up. One is a solution of nitrate of copper in water, and the other is a solution of nitrate of silver in water. The proportions need not be very exact although it is preferable to keep them fairly close. They are made up as follows:

Nitrate of Copper Solution.

Water ..... 1 oz.
Nitrate of Copper .....1 oz.

This gives a practically saturated solution of nitrate of copper in water and is used for a "stock" solution. If desired, the nitrate of copper may easily be made by taking 1 oz. of strong nitric acid and dissolving in it all the copper wire it will take up. A thick, blue solution is left which is used for the "stock" solution. As few platers have nitrate of copper in stock, it can easily be made from the copper wire.

Nitrate of Silver Solution.

Water ..... 1 oz.
Nitrate of Silver ..... 1 oz.

This solution can also be made by dissolving pure silver in nitric acid until no more will dissolve, but dilute acid (1 part acid and 1 part of water) should be used as silver does not dissolve readily in strong nitric acid. It is preferable, however, to purchase the nitrate of silver as it is easily obtained. The nitrate of silver solution is practically a saturated solution and is used as the "stock" solution.

Desk Telephone with the Heat-Black Finish.

The Mixed Solution for Applying

The mixed solution for applying to the metal is made as follows:

Water ..... 3 parts
Nitrate of Copper Solution .. 2 parts
Nitrate of Silver Solution ... 1 part

The solution is kept in a glass or stoneware vessel for use.

Applying to the Brass or Other Metal

The brass, bronze or copper article to be treated is heated on a hot iron plate or in an oven to a temperature of about 250 degrees F. and the solution applied with a brush or cotton swab so as to cover the surface uniformly. The brush should be a rather soft one in order to allow the coating to be made in the best manner. The so-called "rubber-bound brushes" are the best for the purpose as there is no metal on them to be attacked by the solution.

One or two coatings of the solution on the surface of the article is usually enough and it dries almost immediately leaving a sort of green froth. The temperature is not sufficiently hot to draw the temper of hard brass, but it will usually melt soft solder.

When the entire surface has changed to a uniform black color, allow the article to cool and then brush off the fluffy material on the surface of the metal with a stiff bristle brush. The color will now change to a brownish-black that is quite pleasing for many purposes and which is very tenacious. When the fluffy material is completely brushed off, it is surprising how even and uniform the coating is and how tenaciously it adheres. If the brown black finish is desired, the surface may now be waxed or lacquered, but it is usually customary to give the article an additional treatment in a liver of sulphur solution in order to change the brown-black coating to one that is absolutely dead black.

Final Treatment.

When the smut has been brushed off from the surface of the article, it is immersed in a cold liver of sulphur solution for 5 minutes. This solution is made by dissolving 2 oz. of liver of sulphur in 1 gallon of water. The article is immersed in it, allowed to remain about 5 minutes and then, without rinsing, is again heated until the surface is uniformly black.

The surface is now brushed again with the bristle brush when it will be found that the color is a dead black and quite uniform. It should be borne in mind that the article is not rinsed at all after it is removed from the liver of sulphur solution, but is simply drained off and then heated.

The article may now be lacquered with a flat lacquer or waxed as may be desired. The final appearance of the surface will be found quite satisfactory and contrary to what one would naturally expect, the coating of the solution that is first applied need not be very even as long as a sufficient quantity is put on.

The process as arranged by steps may be summed up as follows:

1. Applying the solution to the metal.
2. Heating on a hot plate or oven until the solution has dried and the residue left by evaporation has turned black.
3. Brushing off the smut.
4. Immersion for about 5 minutes in a liver of sulphur solution.
5. Drying without rinsing and heating on the plate or in the oven again.
6. Lacquering or waxing.

If the surface is not satisfactory, or an old article is to be refinished, the wax or lacquer may be burned off and the process repeated.

It is believed that this is one of the most satisfactory black finishes known as it is dead black, is readily applied and is very durable. It is calculated to resist considerable handling such as a telephone, like that shown in the illustration, would receive. There are many articles that can well be treated by it.

A Chromium Alloy for Edge Tools.

As chromium hardens copper and its alloys to such a degree that it will take a cutting edge, James Naulty and John Scanlin of Philadelphia, Pa., have proposed the use of a copper, nickel-zinc and chromium alloy for edge tools (U. S. Patent 959,156, May 24, 1910). The alloy is as follows:

Copper	45%
Nickel	25%
Zinc	25%
Chromium	5%

The method of making the alloy, the inventors say, is to melt the copper and the chromium separately and then mix, after which the nickel and zinc are introduced. It is claimed that the alloy will work hot and will take an edge good enough for edge tools, and at the same time is non-corrosive.

Charcoal should never be used on aluminum while melting as it cannot be completely removed in skimming and black spots will be found on the castings which are made from it.

Advantage of Sal-Ammoniac Over Common-Salt in Nickel Solutions.*

The modern nickel solution is usually made up by the dissolving double nickel salts in water, then adding either sal-ammoniac or common-salt, in order to increase the conductivity, and then making acid with boracic acid. The question whether sal-ammoniac or common salt is better to use in the solution has always been an open one, and while one plater would claim that common-salt is better, another would favor sal-ammoniac. No actual facts could be obtained and it was simply a matter of opinion, and opinions in matters of this kind are frequently of little value.

In order to settle the question it was decided to make some experiments and they were conducted in the following manner:

Four solutions were made up and tested for electrical conductivity. The solutions were:

1. Water, 1 gallon; Double nickel salts 8 oz.
2. Water, 1 gallon; Double nickel salts, 8 oz.; Potassium chloride, 2 oz.
3. Water, 1 gallon; Double nickel salts, 8 oz.; Sodium chloride (common-salt), 2 oz.
4. Water, 1 gallon; Double nickel salts, 8 oz.; Ammonium chloride (sal-ammoniac), 2 oz.

Great care was exercised in measuring and weighing the various materials so as to have exactly the same conditions in each case. The temperature was the same in every test. An anode of nickel and a cathode of brass were used. Both were exactly the same size and the same quantity of solution was used in each test. The object of the tests was to determine the relative conductivity of the solutions and not the absolute conductivity, as this is all that is necessary. The results obtained are as follows:

Relative Conductivity

1. Solution of Double Salts only ... 100
2. Solution with Potassium Chloride 118
3. Solution with Common-Salt 131
4. Solution with Sal-Ammoniac 184

It will be noticed, therefore, that the following percentage increase in conductivity was obtained:

With Potassium Chloride 18% Increase
With Common-Salt ..... 31% "
With Sal-Ammoniac ..... 84% "

These results indicate that potassium chloride is much inferior to the common-salt or sal-ammoniac in a nickel solution, and does very little good. While common-salt increases the conductivity nearly one-third and it can be used with good results, it is much inferior to sal-ammoniac as this substance increases the conductivity 84% and over double that obtained from the common-salt.

In conclusion, *it may be said that sal-ammoniac (ammonium chloride) is the best material to use in a nickel solution.*

*These results were obtained in the experimental laboratory of THE BRASS WORLD.

Use of Magnesium Alloys in Air Ships.

Consul-General Richard Guenther makes the following summarized translation from the *Frankfurter Zeitung* concerning new metal alloys in Germany:

Visitors to the Aeronautic Exhibition at Frankfort last year will remember the "Electron" metal, manufactured by the Chemical Factory Griesheim, which received a prize and attracted great interest on account of its low specific weight. The great technical importance of such alloys that combine a low specific weight with a high resisting power induced many experts to make further experiments in this interesting field. Walter Ruebel, a civil engineer, the inventor of "Ruebel" bronze, has made an alloy which will become a strong competitor of "Electron". Its main ingredient is also the light metal magnesium, which, in its pure state, is entirely unfit for metallurgical purposes, as it is rather soft and little resistant to atmospheric and chemical influences. However, magnesium loses these bad properties almost entirely even if only small quantities of other metals are added to it. Zinc, copper, and aluminum are added in this new invention in varying quantities. It is advisable not to add more than 10 per cent and not less than 4 per cent to the magnesium. A fine-grained, homogeneous alloy of considerable strength and low specific gravity results. This new alloy is of importance in con-

structing air ships. A Zeppelin air ship, with its mechanical parts made of "Electron" metal of this new alloy, weighs 3½ to 4 tons less than were it constructed from the materials formerly used.

New Method of Tumbling Sheet Steel Goods for Removing Burs.

A new method of tumbling sheet steel goods, that have been stamped from sheet metal and have burs or fins on their edges, has recently been discovered and patented by Winslow R. Parsons of Chicago, Ill. (U. S. Patent 957, 999, May 17, 1910). The process, it is claimed, will effectually remove the rough edges from sheet steel goods, such as sewing machine attachments, sheet steel hardware etc.

The ordinary method of tumbling such sheet steel articles for the removal of the fins or burs is to place them in a tumbling barrel with pieces of cast-iron, gravel, steel filings or other similar material that will abrade the surface and remove such imperfections. This method, however, leaves the articles with a rough surface so that they require additional treatment to smooth them up for nickel plating.

The process which is the subject of the patent is carried out as follows:

The sheet steel articles are placed in a tumbling barrel in such a manner that, while they are loose and free to move, they cannot fall far so that denting will result. In the barrel with the steel pieces are placed some small brass pieces such as punchings, rivets or similar articles that are a waste product. At the same time a small quantity of No. 180 emery and a little oil are placed in the barrel. The quantity of brass pieces used should be sufficient to allow the entire surface of the steel goods to be attacked in a short space of time, as a small quantity of brass will not work as rapidly as a large amount. The brass should be small enough to enter all the curved portions or pockets of the steel goods that are tumbled.

The quantity of emery used is mentioned as one-tenth of an ounce to each gallon capacity of the tumbling barrel, and one-eighth of a pint of oil is also employed for the same quantity. This oil should be of a neutral character in order to avoid attacking the steel while the tumbling is taking place.

The emery and the brass, it is claimed, will not only remove the fins and burs from the steel while the tumbling is going on, but will not scratch the surface to any extent, and will leave it in such a condition that by the simple removal of grease, the work is ready for electroplating. The emery apparently imbeds itself in the brass and thus becomes a sort of grinding wheel. As brass itself is soft, it will not abrade the steel at all.

An Improvement in Plaster of Paris Molds.

In a patent issued in 1909, Ernest Bohl of Brooklyn, N. Y. found that if a plaster of Paris mold, made from a mixture of ordinary plaster and ashes, is saturated with a grease, such as for example ordinary lard, it does not absorb moisture when dry and the grease greatly aids the casting of metal in it. In fact, it is possible to cast yellow brass in it, a process that is quite difficult to do with ordinary plaster of Paris molds that have not been so treated.

An improvement in the method has now been made by Mr. Bohl and his associate, Robert Y. Barrows (U. S. Patent, June 7th. 1910). It has been found that if the plaster of Paris mold is placed in the drying oven, and with it is placed the oil or grease that is to be applied to the mold so that it forms a vapor inside of the oven, a much better result is obtained. The oil or grease penetrates the mold more thoroughly and protects it from absorbing moisture. It is claimed by the inventors that in casting metal in plaster molds which have not been treated with grease or oil, that they absorb moisture so readily as to cause the metal to blow or not "lie" to the mold when it is poured. When the mold is saturated with grease, however, it may remain in the air almost indefinitely without injuring it.

For producing a fine surface on brass castings, it is customary in the Eastern part of the United States, to face the mold with Windsor-Locks sand, skin-dry and then smoke the mold before pouring.

Metal Working in Japan.*

In Old Japan, said Professor Gowland, there were five metals held in high esteem by the artist craftsmen. With iron and tin he would not concern himself, but confined his attention to gold, silver, and copper. The old workers believed in the gradual transmutation of the baser metals into gold under favorable conditions, but by accepting 200 years as the probable time required they put themselves out of the category of the alchemists of Western Europe. The earliest supplies of gold were obtained from river beds, but later a system of crushing auriferous ores by hammers, grinding, and washing, became common, the process being explained by the lecturer by referring to a copy of a native drawing. These workmen, though highly skilled, received no pay, depending for wages on the gold dust they recovered from their own clothes.

Travellers' Tales.

The tales of the old voyagers about the prodigious quantities of gold on the Japanese temples must be discounted, for the metal mounts which gave rise to them were usually of copper, gold washed. Gold in Old Japan was not plentiful, and for many years laws restricted the wearing of gold to certain ranks. The gilding of copper had been carried to perfection by the Japanese, who treated the surface of the metal by processes involving the use of vinegar made from unripe plums and a mercury amalgam to leave a coat of fine gold on the underlying copper. Formerly only a sword mount, a pipe ornament, and a pouch clasp were used by men, and hairpins by the women, which with an occasional drinking-cup represented the personal and domestic use of gold. Professor Gowland recalled an incident when he was at the Royal Japanese Mint involving the melting down of two temple caskets weighing 300 oz. Fortunately for his own reputation he insisted on the presence of two priests when the metal was melted and poured, for the "gold" came down as a white alloy which on assay showed sixty-six parts of pure metal and the rest chiefly silver. It was by means of the after-process which removed the surface silver that the colour was restored to the alloy. Assaying in Japan down to the time he came home was successfully done with touchstone, no acid being employed. Expert native assayers could get within ten parts of gold in 1,000 in samples of usual grades.

Shakudo.

Silver had been used from very early times, and was much used down to the eighth century, but from that period the great priesthood of Buddha seemed to have discouraged its use for the temples, and it was not until the close of the Civil War in the sixteenth century that it became commonly used for objects of utility and art. Old Japan in time came to use alloys of copper and silver, because the latter when cast did not pour well and was not hard. A celebrated alloy which was essentially native to the country was shakudo, an alloy containing from 94.5 to 99.4 of copper, gold up to 4.16, silver to 2.06, and lead up to .11 parts, with now and again a trace of iron and arsenic. Shakudo looked like gunmetal, but when coloured by boiling in a wood-ash lye, polished with charcoal powder, and subsequently treated first in a plum-vinegar bath, and then, after washing, boiled in a solution of copper sulphate and verdigris, the resulting patina was celebrated for its sheen and velvety blacks, which constituted an ideal back for delicate inlay work.

After the Japanese had beaten China in the last century, it was decided to cast medals for the troops from the captured guns. The metal had not the requisite gold in it, but his assistant at the Mint, after careful experiment, found that a beautiful black patina could be obtained from the metal melted down with a

*On May 24th. Prof. W. Gowland gave a lecture on the Art of Working Metals in Japan before the *Institute of Metals*. Owing to lack of space we are unable to print the complete article, and are indebted to *The Ironmonger* for the accompanying excellent abstract.

Prof. W. Gowland, F. R. S., at present Professor of Metallurgy at the Royal School of Mines, is a past-President of the Institute of Mining and Metallurgy, and also of the Royal Anthropological Institute. Prof. Gowland is a Fellow or member of many scientific bodies, and between 1872 and 1888 was Chemist, Assayer ,and Foreign Head of the Imperial Mint of Japan, of which country he is a Chevalier of the Imperial Order of the Rising Sun.

small percentage of iron-arsenic speiss in the proportion of 60 per cent. iron to 32 per cent. of arsenic. The medals from this new alloy were boiled in a solution of copper sulphate 2½ grammes, verdigris 3 grammes, and water 2 liters. The finished surface was a beautiful black patina.

Another art alloy, called shubuchi, was composed from silver and copper in varying proportions respectively, from 50.7 to 13.5 of silver and 49.18 to 86.48 of copper. Immersion in plum vinegar and other treatment gave in this case greys of great beauty.

Smelting Copper.

Professor Gowland then proceeded to discuss the smelting of copper ore as formerly practised, and still in vogue in the small mines, and claimed that prospectors would be well advised to follow the methods of Old Japan. The tatara represented a most efficient and powerful bellows for blast. Six or eight men, half at each end, stepping alternately on and off the board, and keeping time by song, would bring down two tons of metal an hour at a cost of 6*d*. or 8*d*., for their wages were only a penny. Most of the furnaces were made below the ground, and charcoal round and above the metal was used as fuel. The lecturer minutely described the means employed to reduce the ore to slab form, and the reduction of the slab to pure copper by the elimination of any lead, silver, arsenic, and bismuth present.

Finally, the copper was poured in canvas moulds under water, carefully maintained at a temperature between 150° and 175° Fahr. When lifted therefrom the slab or ingot was exposed for a while to the steam and air, and it was this and an added percentage of lead that gave the ingot its peculiar rose colour, a colour which was so permanent that it was hard to decide which was the older of the two slabs exhibited by Professor Gowland, who said one was certainly poured sixty years ago.

The Artist-Bronzefounder.

Continuing, details were given of the processes adopted by the bronzefounders. By means of diagrams the lecturer explained how he saw a big brazier made. Vessels of the kind indicated never had a bottom in them. What we should call a collapsing skeleton core frame was made and bound round with bamboo strips. This was coated with clay, and that material in turn with wax to a thickness sufficient for the artist to work out his decorative scheme. This done, a very fine refractory clay wash was spread over the wax, and this coat followed by others, each being dried after it was put on. When a fair thickness had been deposited, more clay was plastered on the outside; then the core frame was removed and the mould was opened at points at the bottom and placed on a charcoal fire. This melted out the wax and dried the whole thoroughly. When the day came to cast the brazier the mould was set on a brick base, a fire built in and around it, and the whole carefully heated, while the metal was melting in a cupola of suitable size, which was almost invariably brought on to the job whether the work was done in a foundry or in a temple garden, say, in the case of an idol or a bell.

When the metal was ready it was tapped and poured through gates into the mould, from which the glowing charcoal was pushed aside. In the example described, the first pour took the bronze through four gates to the belly line. The gates were then closed with clay botts, and the top half poured through other three gates in the neck. To prevent air accumulating in the mould labourers tapped the shell with light bamboo canes during and after the flow of the metal. The bronzes of Japanese foundries possessed low melting points, were fluid in a high degree, and took very sharp impressions.

Aeroplane Metal.

Editor:

In view of the great interest manifested in light castings for aeroplanes, automobiles etc., it should be of interest to your readers to know that English patent No. 22,073 of Oct. 13, 1903 granted F. W. Green and T. Prescott covers alloys consisting of the following:

Aluminum	70 to 90 parts
Magnesium	5 to 18 parts
Cadmium	2 to 12 parts

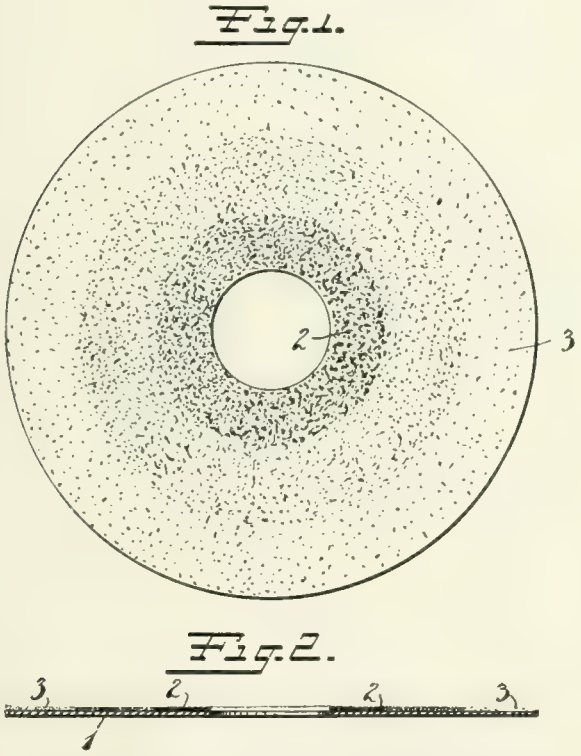
It is recommended for a large variety of work requiring a light metal.

C. W. Leavitt & Co.

New York City, June 10th. 1910.

A Compound Grinding and Polishing Disc.

A new and novel form of disc for use on the well known forms of disc grinders has been patented by Charles Glover of New Britain, Conn., (U. S. Patent 959,054, May 24, 1910). The novelty of the invention lies in the fact that the disc, which is made of cloth and is glued to a steel or iron disc plate on the grinding machine, is coated with a number of different grades of emery varying in fineness from that required for grinding to the finest material used for polishing.



Compound Polishing and Grinding Disc.

The coarse emery is applied to the center of the disc, and it is followed by finer grades until the finest is reached at the periphery of the wheel. It has been found that if the grinding is commenced at the center and continued outwards, there is then no tendency to ruffle or tear the disc.

The grinding of a piece of work is started at the center of the wheel and then, by the simple moving of it from the center to the edge, the first grinding and final polishing are accomplished. The advantage of the disc will at once be understood when it is appreciated that work may be ground and finished on one disc by simply moving it from the center to the edge. Ordinarily several discs have to be used in order to bring the surface of the work up to the required degree of fineness for the final finishing.

Correspondence.

Graphite Babbitt-Metal.

Editor:

I was quite amused to read in the June issue of THE BRASS WORLD page 207, the description of a material in the form of babbitt containing graphite, and which it is stated originated in Germany. In connection therewith it may be of interest to your readers to know that some six or seven years ago I produced this material and made an application for a patent upon it, but found that in the Patent Office an earlier patent was so broadly worded that it covered this same idea. This patent was so broad in its wording that it covered the introduction of graphite into the metal by subjecting the mixed particles thereof to pressure, but it did not make any mention of how the graphite was incorporated with the metal in the first place. Nevertheless, without pressure, the process is of no value.

In the material that I formerly made, I pursued precisely the same method as outlined in the aforesaid article, i. e. by mixing graphite with the metal while in the plastic condition. I have experimented with quite a number of alloys which contain a eutectic mixture, and also have tried "Plastic Bronze", but in the latter case was not very successful although I succeeded well with soft metal mixtures. The difficulty which I found with the mixtures of babbitt-metals and graphite, however, was that they were not sufficiently strong. This was probably due to the use of too great a quantity of graphite.

G. H. Clamer,
The Ajax Metal Co., Philadelphia, Pa.

Making an Alloy of Copper and Tungsten.

According to a recent patent issued to Gideon Boericke of Philadelphia, Pa., an alloy of copper and tungsten may be made in the following manner:

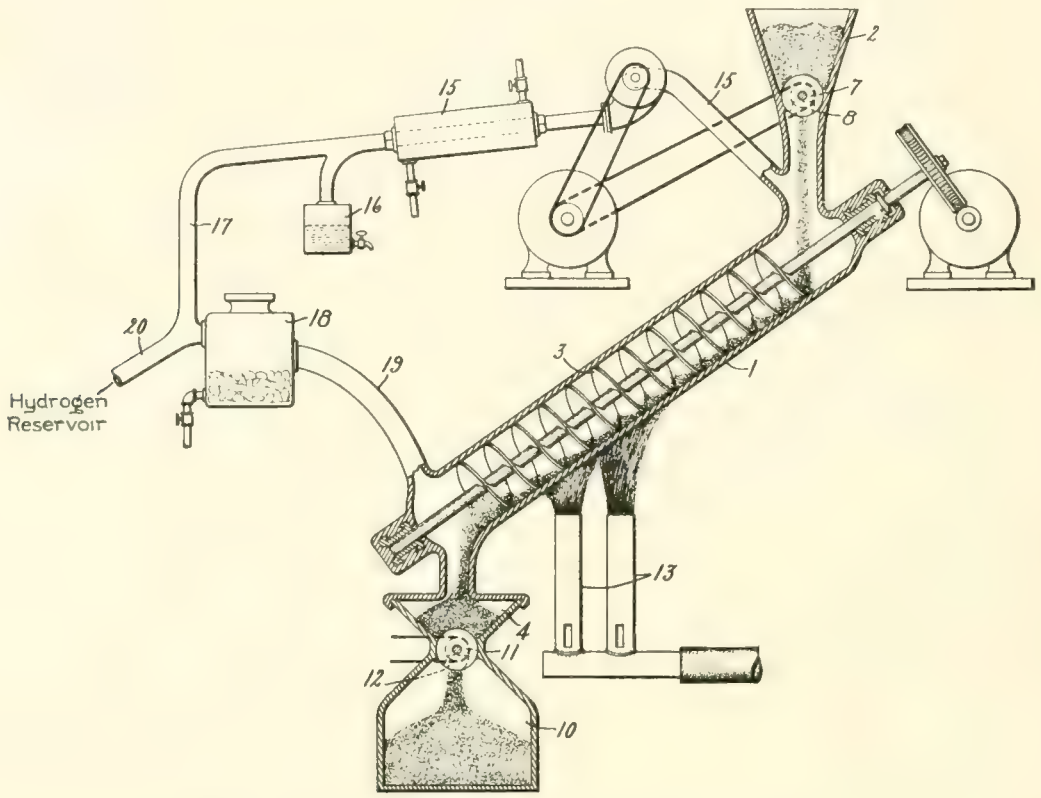
A solution of copper sulphate is precipitated by means of sodium tungstate and a copper tungstate is produced. This is filtered out, washed, dried and reduced by carbon by smelting and an alloy of copper and tungsten is formed. The inventor states that "the product is of a very superior character, having great ductility as well as other desirable characteristics".

Apparatus for Producing Metalic Tungsten.

Now that tungsten has become so extensively used in the manufacture of filament electric lamps, much attention has been paid to the manufacture of the pure metal. The first process for making tungsten is the reduction of the oxide by hydrogen gas, and it is then obtained in a fine powder that is afterwards fused.

Elihu Thompson of the General Electric Co., of Lynn, Mass. has recently patented a method of making metallic tungsten in a fine state of division (U. S. Patent 960,441, June 7th. 1910). The apparatus for reducing the tungsten from the oxide is herewith shown. The pure oxide is fed from a hopper 2 into a tube 1 which is supplied with an Archimedean screw 3 in order to break up the oxide and expose as much surface as possible during the reduction. The tube is heated by the gas burners 13 to a temperature of about 600 to 800 degrees C. which is sufficient to reduce the oxide. Dry hydrogen gas is passed in through the tube 19 in the opposite direction from that of the stream of oxide, so that there is no re-oxidation by the moisture formed. The unused hydrogen, which contains moisture, is drawn by the fan to the condenser and is then dried by calcium chloride so that it can be used over again.

The reduced and finely divided tungsten is delivered in the receptacle 10. In order to render it massive, or in a form for use in filaments for lamps, further treatment, of course, is necessary.



Elihu Thompson's Apparatus for Reducing Tungsten.

Preparing Steel or Iron Work for Electrogalvanizing.

According to Hermann Vollert of Hagen, Westfalen, Germany, iron or steel work to be electrogalvanized may be satisfactorily cleaned and prepared for the operation in the following manner:

The work is first treated with benzine or other material for removing most of the oil or grease, if it has considerable on it, and is then treated in the following solution used as an electric cleaner:

Water	1 gallon
Caustic Potash	¾ lb.

The steel or iron work to be cleaned is made the cathode and an iron or preferably carbon plate is the anode. A current of from 10 to 30 volts is maintained for two or three minutes when the work is ready, after rinsing, for the electrogalvanizing.

Obstacles in Depositing Black Nickel.

Now that black nickel is beginning to be used quite extensively, platers are encountering the usual difficulties in the working of the solution. There is probably no plating solution in use at the present time which is the cause of so much trouble; and it is due to a lack of knowledge of the right method of running it. To begin, let it be known that the following is the best formula for the electro-deposition of black nickel:

Water	1 gallon
Double Nickel Salts	8 oz.
Ammonium Sulphocyanate	2 oz.
Zinc Sulphate	1 oz.

In working the solution, let the following points be particularly noted:

1. The solution is used cold.

2. The voltage of the current should be low. If over 1 volt is used the deposit is streaked. If still higher it will come white. The best voltage is from ¾ to 1 volt.

3. As the solution has no grease removing power, work should be cleaner than for the deposition of metals from cyanide solutions. A good method is first to deposit a light coating of white nickel on the work and over this the black nickel.

4. Do not deposit too heavy a coating of the black nickel. Remember that it is a rather brittle deposit and that it is more apt to flake when heavy. As soon as an even deposit has been obtained that is black, then stop. The time required for this is from 20 minutes to one hour depending upon the character of the work.

5. The black nickel solution does not work well for basket plating unless the trouble is taken to flash the basket after each operation in copper. The reason for this is that the basket becomes coated with the black nickel deposit and which is a bad conductor of the current. The work then refuses to take the deposit well on account of the difficulty of forcing the current in, but by coppering after each plating operation, the basket becomes a good conductor.

6. To remove the brown shade of the deposit of black nickel, dip the work in a solution of the following:

Water	1 gallon
Iron Perchloride	12 oz.
Muriatic Acid	1 oz.

Then rinse and dry. Leave in this dip only for a few seconds.

7. Always lacquer a black nickel deposit as it will turn iridescent in time or become brown, but when lacquered it will remain black indefinitely.

Use of Aluminum in Electrical Resistance Wires.

Attempts have previously been made to use aluminum in making copper alloy resistance wires, but it was found that such alloys did not appear to have any advantages, and in many instances the use of aluminum proved a detriment. The so-called aluminum bronzes are examples of this kind and they have no value as resistance material as their resistance is too low. Wilbur B. Driver of Newark, N. J. has found, however, that the use of a *small* quantity of aluminum is of value in resistance wires containing copper and nickel, copper nickel and manganese, copper and manganese, iron and nickel or other similar alloys (U. S. Patent, 961,217, June 14, 1910).

It has been found that, while large amounts of aluminum in the copper and nickel or copper, nickel and manganese alloys serve only to harden them without any advantageous electrical effect, the employment of small quantities of from 1% to 2% of aluminum serves to *fix* the electrical properties of such alloys. It does not cause any thermo-electric effect against copper, and in this respect behaves like nickel. The aluminum, on account of the fact that it is a light metal, also increases the electrical resistance in a marked degree when small amounts are added.

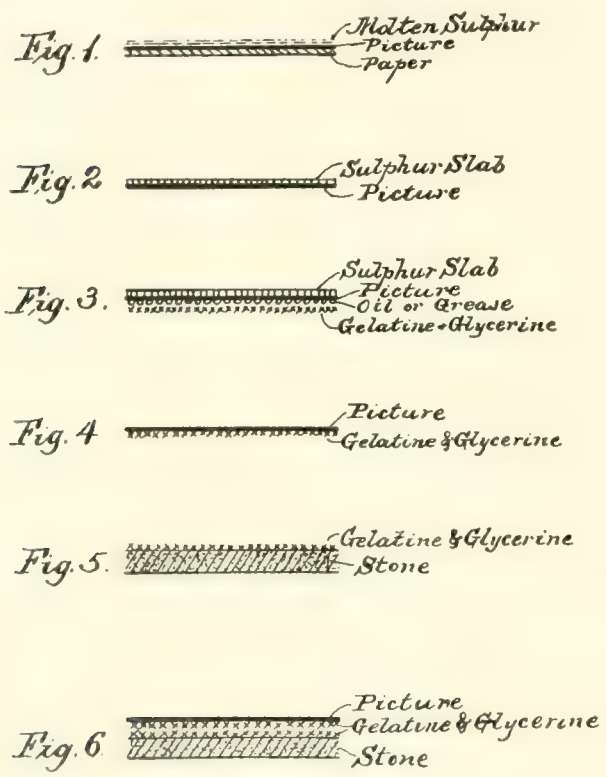
The use of any particular alloy is not claimed in the patent, but those above mentioned containing from 1% to 9% of aluminum. In other words, the use of from 1% to 9% of aluminum in the copper and nickel alloys, the copper and manganese alloys, or the copper nickel and manganese alloys is claimed when used for electrical resistance purposes.

The most durable finish that can be produced by liver of sulphur is that formed by oxidizing silver. It is far more durable and tenacious than oxidized copper.

Process of Transferring Photographs or Printed Pictures to Metal, Glass Etc.

A method has been discovered by A. L. DeRooy of Haarlem, Netherlands, for transferring photographs, print pictures etc., to metal, wood, glass, porcelain and other substances.

The process consists in coating a picture, produced on paper by printing or in other suitable manner, with molten sulphur, and after the sulphur has set, the paper which serves as the carrier for the picture is removed by softening with water, so that the picture is now visible as a reverse picture on the sulphur foundation or backing. The picture which is then adhering to the sulphur is coated with oil or some other greasy substance, whereby the connection between the picture and the sulphur is loosened, but not quite destroyed. A slightly warmed mixture of water, gelatine and glycerine is then spread in a very thin layer on the picture which as stated is coated with oil or other suitable greasy substance. This mixture is formed by dissolving gelatine in warm water and adding a little glycerine for instance a seventh part of the gelatine used. The sulphur slab treated in this way is then allowed to dry in a hot temperature. The extremely thin layer of gelatine and glycerine attracts the picture, so that it will come entirely away from the sulphur. The layer of gelatine and glycerine frees itself during the drying from the sulphur slab, the picture remaining on the gelatine-glycerine layer. A very dilute solution of the gelatine-glycerine compound hereinbefore mentioned is then spread on the article on to which the picture is to be transferred, whether it be a tile, earthenware, canvas, wood, glass, iron or other suitable material, whereupon the gelatine-glycerine layer, removed from the sulphur slab, is conveyed together with the picture, on to the article, so that the two gelatine-glycerine layers lie one upon the other. They now coalesce together and form a whole. The picture is then located on the article not as a reverse picture but like it originally was.



Showing Various Steps in the Process.

In the accompanying drawing is illustrated the several steps of the process diagrammatically.

Figure 1 represents a picture and its backing with the molten sulphur on the picture. Fig. 2 represents the picture with its backing removed and the sulphur dried on the picture. Fig. 3 represents the same with the picture coated first with oil or other greasy substance and then with a mixture of gelatine and glycerine dissolved in water. Fig. 4 represents the picture adhering to the gelatine-glycerine layers and separated from the sulphur slab. Fig. 5 represents a stone or other object coated with a dilute solution of glycerine and gelatine. Fig. 6, represents the picture shown in Fig. 4, placed upon the object shown in Fig. 5.

An Improved Method of Making Sand Cores with Oil.

An improved method of making sand cores by means of linseed or other kinds of oil has been discovered by George W. Lewis of Scranton, Pa., and which he has deemed worthy of patenting (U. S. Patent, 960,973, June 7, 1910.)

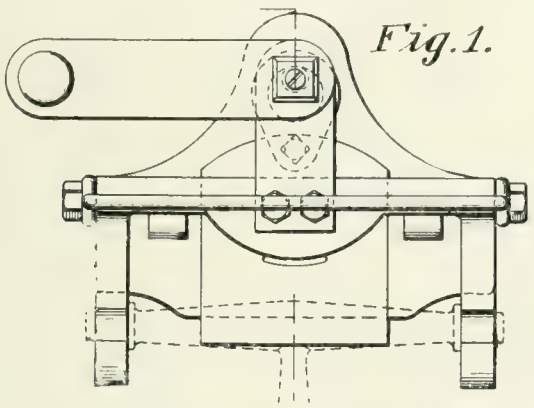
The ordinary method of using linseed or other oil in making a sand core is to mix the required quantity of sand, oil and water together, form the core in a core-box and then bake it. The objection to this method is, the inventor states, that too much oil is used. The method which he uses is as follows:

The oil and the water are first mixed as an

emulsion and the sand is then wet down with it to the desired degree. The core is then made by ramming the sand in the core box in the usual manner. The proportions of oil and water necessary in the method are given at proportions ranging from equal parts of oil and water to twenty per cent of oil and eighty per cent of water.

A New Process of Lead-Lining Journal Bearings.

The ordinary method of lining bronze journal bearings with the so-called "babbitt-metal" (which is, in the majority of instances, antimonial lead) is by placing them against a round iron or steel mandrel and then pouring the babbitt-metal in the space between. Ac-

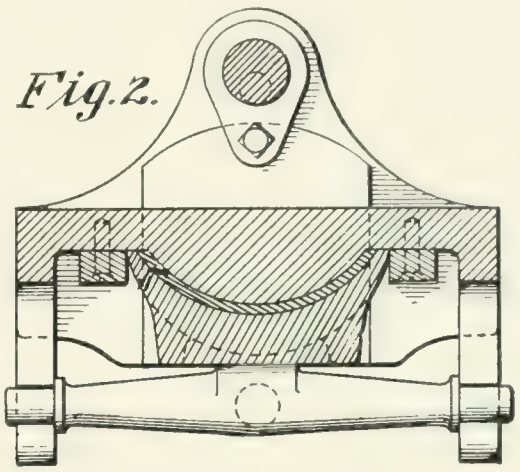


Plan View of Holder.

cording to the invention of Frank H. Howard of Reading, Pa. (U. S. Patent, 960,328, June 7, 1910.) better results are obtained by pouring the metal from the bottom so that blowholes, dross spots and similar imperfections do not form.

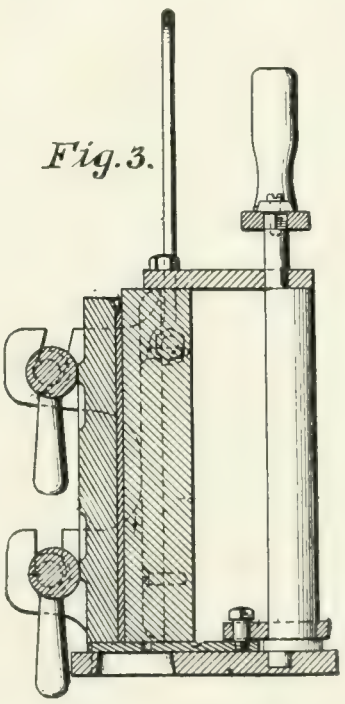
In the drawing; Figure 1 is a plan view of the holder, with the sluice gate in forward position, showing the feed opening. Fig. 2 is a cross-section thereof, showing a bearing in position in the holder and filled or lined. Fig. 3 is a vertical central sectional view of the holder with a bearing in position, lined, and the feed opening closed.

The numeral 1 designates the holder which is formed with its inner surface 2 of substantially the same contour as the inner surface of the journal bearing, and of the exact contour of the shaft or axle on which the bearing is to be used. This holder is provided with two pairs of arms 3, each of which is slotted at 4 to receive the ends of a pair of eccentric clamps 5 for securing the bearing in the holder. The holder has an opening 6 in its bottom and is formed with a rearward extension at this point, 7, in which is mounted a vertical, eccentric rod 8 provided with an operating crank 9 at its top. This eccentric



Cross-Section of Holder.

rod has a cam 10 secured thereto at the bottom, which is in turn pivoted to a sluice gate 11 adapted to slide on the upper surface of the extension 7 and to close the opening 6. This



Vertical Cross-Section of Holder.

gate has an opening 12 therein, which, when the gate is at its closed or innermost position, registers with the space between the inner surface of the bearing and the inner surface 2 of the holder, that is, with the space that is to be filled with the molten metal to form the lining of the bearing 16.

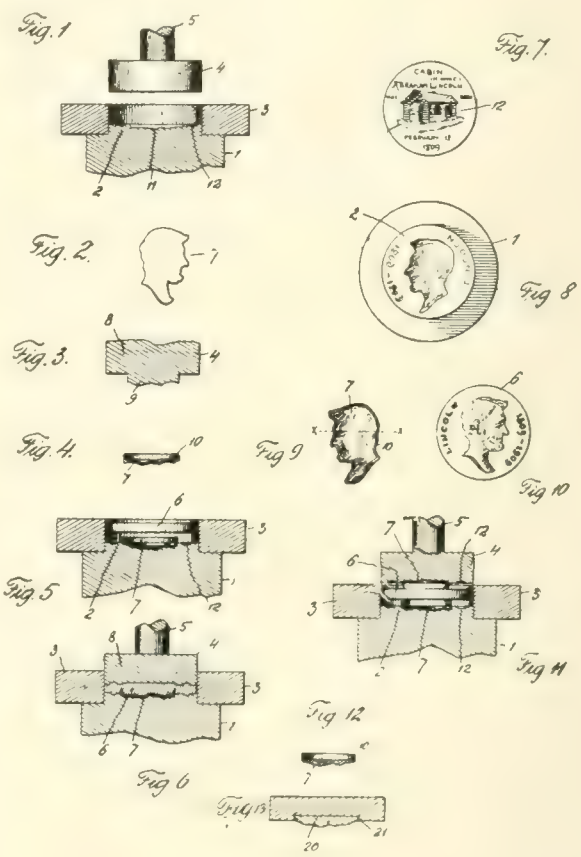
The numeral 15 designates the journal bearing. This bearing is placed in vertical position in the holder and the clamps 5 are turned to secure it therein, as shown in Fig. 3. The crank 9 is then turned to the position shown in Fig. 1, thus allowing the opening in the sluice gate to register with the space between the inner face of the holder and the inner wall of the bearing. The holder, which is provided with a suitable handle 20, is then immersed in a mass of molten metal to the desired depth, that is, to a depth slightly less than the length of the bearing to be lined, and the metal will enter the opening 12 in the bottom and find its way up in the bearing, forcing out any gas or air that may be formed, at the top. When the bearing has been filled, the crank 9 is turned in the reverse direction, thus closing the sluice gate at the bottom of the holder and the holder is lifted out of the molten metal and when sufficiently cooled, the bearing is removed from the holder and replaced by another and the process continued.

It is evident that a lining is formed with a smooth and perfect surface, as all the gases or air bubbles have been allowed to escape from the top during the process of filling the bearing.

A New Method of Making Medals.

The method of making medals is by use of an ordinary press for medium sizes and hydraulic presses for large sizes. Not only is the amount of metal used considerable, but much labor is involved. If medals are made from sheet metal with only one side struck up, they do not have a satisfactory appearance. Wm. E. Heeren of Pittsburg, Pa. has recently invented and patented a method of making a medal with two sides from thin sheet metal, so that when placed together it has the appearance of having been made of solid metal. In addition to this feature, it is possible to make the medal of two different kinds of metal which, for certain purposes, greatly enchances its value. The method used is as follows:

Figure 1 is a vertical sectional view of a portion of the device for producing a button or medallion, Fig. 2 is a plan of a blank adapted to form a part of the button or medallion, Fig. 3 is a cross-sectional view of a formative die having an alto-rilievo former for pressing and shaping the blank shown in Fig. 2, Fig. 4 is a cross sectional view of a pre-pressed blank or the anaglyph portion of the button or medallion, Fig. 5 is a vertical sectional view of a portion of the device illustrating a pre-pressed blank and disk in position to be pressed and stamped, Fig. 6 is a similar view illustrating a plunger stamping and pressing the disk and blank, Fig. 7 is a bottom plan of the plunger



Various Stages of the Process.

showing the intaglio die for stamping the disk, Fig. 8 is a plan of the stationary die of the device, Fig. 9 is a plan of a pre-pressing blank, the cross sectional view shown in Fig. 4 of the drawings being taken on the line *x*—*x* of this figure, Fig. 10 is a plan of a medallion constructed in accordance with my invention, Fig. 11 is a vertical sectional view of a device for producing a button or medallion having a mezzo-rilievo configuration upon both sides, Fig. 12 is a cross sectional view of a pre-pressed blank having a solid body provided with a peripheral flange. Fig. 13 is an enlarged cross sectional view of a button or medallion, illustrating a dovetailed connection

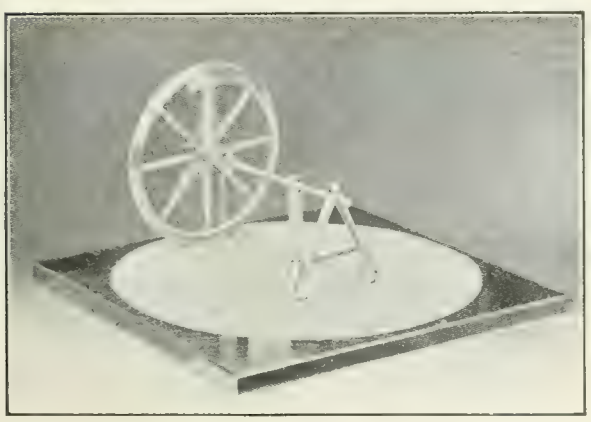
between the blank and disk of the button or medallion.

The device employed for carrying my invention into effect comprises a stationary die block 1, having a cylindrical die 2 surrounded by a detachable collar 3, said collar being of a depth approximately twice the depth of the die 2, whereby a die 4 carried by a plunger 5 can enter the collar 3 and press metal or material between said dies.

The buttons or medallions can be made of various kinds of material,—metal, as aluminum, white metal, tin, lead, etc., or an indurate plastic material as celluloid, rubber, or wax, whereby beautiful contrasts can be made to produce attractive and well designed buttons or medallions, according to one's esthetic taste.

The Bristol-Durand Radii Averaging Instrument.

A new instrument for averaging the record of a circular chart made during the whole 24 hours, has recently been placed on the market by the Bristol Company of Waterbury, Conn., the well known makers of the Bristol Recording Instruments. This new device is called the "Bristol-Durand Radii Averaging Instrument".



Bristol-Durand Radii Averaging Instrument.

The manner of using it is shown in the illustration. It is placed on the chart and the tracer point follows the record curve. The chart is turned with the other hand. By referring to a line plotted on a sheet of cross-section paper (supplied with the instrument) the total record for the whole 24 hours may be taken off directly. Full directions accompany the instrument, and it is used for plotting any chart used on the Bristol recording devices.

In the United States, fire-gilding is almost exclusively limited to the manufacture of high-grade gold plated buttons, and is used only to a very limited extent upon other kinds of goods.

The best flux for zinc has been found to be sal-ammoniac and a small quantity is sprinkled on the surface from time to time. It is decomposed by the oxide of zinc, forming water, ammonia and zinc chloride which fuses down to a slag and is readily skimmed off.

Much care must be exercised in the use of iron or steel plating tanks to prevent short-circuiting or grounding of the electric current. The tank should rest upon bricks soaked in melted paraffine which are insulators and will not absorb moisture.

In dissolving fine silver in nitric acid, always use dilute acid as it does not dissolve readily in strong acid. The usual strength of acid is 1 part of strong nitric acid (which should be chemically pure) and 1 part of water. The action goes on more rapidly when warm than when cold.

In dissolving silver in nitric acid, the solution is frequently green, yellow or pink. This does not mean that the silver is contaminated with copper, iron or other metals, but that gases in the form of oxides of nitrogen have dissolved in the solution from the decomposition of the nitric acid. The color will disappear on boiling.

Although yellow brass is readily oxidized by the use of a hot dip composed of ammonia and carbonate of copper, it is often preferable to oxidize it by first copper plating it and then treating in a cold liver of sulphur solution. Large work is usually oxidized in this manner as the results are then positive and certain.

Questions and Answers.

QUESTION No. 825. We are having some trouble with our gold solution (Roseleur's phosphate bath). When plating high-brass articles spots appear on the surface after gilding. The brass is matt dipped before plating. After dipping, we rinse the articles in a cream of tartar solution before gold plating. Samples are sent which show the spots.

Answer. From an inspection of your samples we should say that the stains have been caused by the tarnishing of the brass surface after dipping and before gilding. We suggest the use of a cyanide dip immediately before gilding as it will remove any stain from tarnishing. Dissolve 1 lb. of cyanide in 1 gallon of water and use cold as the dip. It will remove any stains that may be on the surface and give a clean surface for gilding. Dipped surfaces are very readily tarnished for the reason that they are chemically clean.

QUESTION No. 826. Please advise us as to the best method of making fine, round grain brazing solder? Is it possible to pour the mixture into water and obtain a round grain?

Answer. In order to obtain round grain brazing solder made of half copper and half spelter or thereabouts, it is necessary to pour the metal on the end of a trough which is slightly inclined so that it will run down it and become spherical. At the bottom of the trough is a tub of water and the shot fall into this and cool. The process is analogous to that used in making lead shot which must be made round by rolling down an incline.

QUESTION No. 827. We have noticed in past issues of THE BRASS WORLD, references to tin being used in bronze solutions. We are plating iron and steel screws and would like to use it. How much is added to the solution?

Answer. We do not advocate the use of tin in bronze solutions except in instances where a particular shade is desired that cannot be produced with copper and zinc. For all ordinary purposes copper and zinc give all that is desired in a bronze solution and is far easier to work than the tin bronze. The copper and zinc solution is almost universally used for a bronze among the hardware trade. If you desire to use the tin, dissolve some tin chloride (tin salts) in a strong solution of potassium cyanide and add little by little, trying after each addition, to a good cyanide copper solution. In this manner you can obtain any desired shade. It is very difficult to make it up by taking a known weight of tin chloride on account of its varying purity and the effect of varying amounts of free cyanide in the copper solution.

QUESTION No. 828. What makes a 14 karat gold crack in rolling? We are using the following mixture:

Gold	14 parts
Silver	5 parts
Copper	5 parts

The copper we are using is shot, the gold is Government assay bars and the silver 999 fine in the granulated form. We cast the bars in the usual manner, but when we roll them they crack. Some crack on the edges only, while others crack to pieces in the first pass through the rolls. We melt in graphite crucibles.

Answer. Your difficulty is caused by the presence of oxide of copper in the gold mixture, produced by the oxidation of the copper during melting. You can overcome this by the use of an alloy of copper and zinc instead of the copper. Make an alloy as follows:

Copper	85 parts
Zinc	15 parts

Pour into water while melted in order to make shot of it, and then use instead of the copper. The zinc in the mixture will reduce the oxide of copper and give a tough gold that will roll. This method of overcoming the brittleness is now in quite extensive use. Keep the gold well covered with charcoal during the melting.

QUESTION No. 829. Is there any dip that can be used to coat iron with aluminum like that which is used for coating it with iron? We are conducting a jobbing shop and had a call for such a finish. Our customer said that such work is being done.

Answer. There is no dip that is known that will coat iron with aluminum. What your customer has in mind is undoubtedly electrogalvanizing. When fresh and well done, an electrogalvanized surface has the appearance of aluminum and goods thus plated are often sold under the name of the "Aluminoid" finish. A good job of electrogalvanizing is quite white.

QUESTION No. 830. Can silicon-copper that is in the form of powder be used in making pure copper castings? We have some that has been ground or has been pulverized in transit and we are afraid to use it. There were some lumps in the lot received and we obtained good results with them, but we fear the powder will not mix with the copper.

Answer.. While you can use the powder if you stir in the copper immediately after introducing, it is better to use the lumps as they are less apt to oxidize and waste. The powder was apparently produced by the jarring or abrasion of the lumps on one another during transit as no one who makes silicon-copper pulverizes it.

QUESTION No. 831. What causes silver solutions to deposit bright in spots? In plating hollow-ware, we find that while some parts of the deposit are dead, as they should be, others are bright. We have been unable to overcome it.

Answer. Sulphur has entered your solution in some way. When a very minute amount is present, the deposit will come "patchy" as you have found. An increased amount will give a bright silver deposit. The sulphur may have been in the cyanide as it frequently contains more or less of it, or it

may have entered from rubber covered-copper wires, or some bright solution (if you use it in your plating room) may have contaminated it.

Question No. 832. What is considered the standard percentage of zinc and copper in low-brass, high-brass, and gilding or red brass?

Answer. The mixture generally employed for low-brass is 4 parts of copper and 1 part of zinc (80% copper and 20% zinc). For high brass the mixture varies with the maker as some use a little more spelter than others. The average mixture of high brass is from 63% to 64% of copper and the remainder is zinc. Large quantities of high brass are made containing 66% of copper and 34% of zinc and which is used for spinning or drawing. It may be said that high-brass may contain from 60% to 70% of copper and yet come under the name.

Question No. 833. I am employed as a nickel plater in a stove shop and our work requires a heavy deposit. Heretofore my results have been good, but recently the work has come out pitted. I run my nickel, at from 7 to 8 degrees Beaumé. About a year ago, the plating room being very cold, we put in a lead steam coil to take the chill off and it worked satisfactorily. Several months ago we installed a movable plating apparatus and since that time the work has come out pitted. Can you suggest any reason for the pitting?

Answer. Your difficulty is apparently caused by exhausting the solution, to a certain degree, of nickel, and also by its becoming too acid. Your movable plating apparatus allows very rapid deposition and this frequently causes the nickel to be taken out of the solution more rapidly than it is dissolved from the anodes. The remedy is to add single salts to your solution and try it. This often overcomes pitting and if not, it is caused by too much acidity. To overcome this, add carbonate of nickel. An excess of either the single salts or the carbonate of nickel will do no harm. You will probably find that the pitting will be overcome.

Question No. 834. We are having considerable difficulty in obtaining good castings from a mixture of 84% copper, 9½% tin, and 6½% of lead. The castings are very spongy under the surface. We have tried several ways of molding, re-melting and fluxes, but we are still unable to get good castings. We should like to have your comments on the matter, with remedy, if possible.

Answer. You will find considerable difficulty in making sound castings of the mixture you are using, unless you use some de-oxidizing agent, such as phosphorus. If you use a small quantity of phosphorus in the mixture we believe you will be able to overcome your trouble. Use the following proportions:

Copper	84 %
Tin	7½%
Lead	6½%
5% Phosphor-Tin	2 %

The use of the phosphor-tin will prevent the blowholes which have bothered you.

Question No. 835. What is the best method to pursue in brass plating cast-iron so as to prevent the formation of stains after drying and lacquering?

Answer. After the castings have been cleaned (the method for which you no doubt understand), they should be flashed in copper in a hot cyanide copper solution. This greatly aids in producing a good brass deposit. The covering of the cast-iron with copper renders it a good conductor and the brass deposit then covers it evenly. Without the copper deposit, the brass cannot be deposited as satisfactorily. When the brass deposit has been put on, rinse the castings thoroughly in cold water, and then allow them to soak for several hours in hot water. This will serve to remove the solution from the pores of the casting. Then rinse in cold water, then in clean hot water again and dry. Then allow to remain for several days or longer until what solution is in the pores of the casting has had an opportunity to work out. Then buff or dip as may be desired, lacquer and the casting will probably not bother you by staining.

Question No. 836. Is there such a thing as a red or a yellow soft solder? We want to solder copper and brass and desire to have the solder possess the same color.

Answer. All soft solders are white. None are known with a yellow or red color. There are no red hard solders as copper is the only red metal. Spelter solder is yellow and you will have to use it on the brass if you wish a yellow color.

Question No. 837. Is fluor-spar mined in the United States? What are the uses for it? Is there any imported?

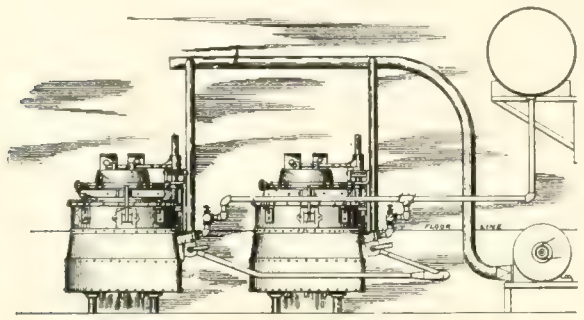
Answer. Large quantities of fluor-spar are mined in the United States, and it is found associated with sulphide of lead ores or galena. Wherever galena occurs, the fluor-spar is also found. Fluor-spar is used as a flux in brass melting, in iron smelting and melting, in copper refining and in the refining of tin drosses. The largest consumption, however, is in the manufacture of hydro-fluoric acid. It is also used in enameling. The greater part of the fluor-spar used in the United States is mined here, but some is imported.

Question No. 838. Would a current of 6 volts be sufficient for running an acid copper solution? Our dynamo gives a current of this strength and would like to know whether it would do.

Answer. A 6 volt current is altogether too strong for an acid copper solution as now made up. It will burn the deposit so that it will be almost black and will rub off. A current with a tension of from 1 to 1½ volts must be used to obtain a good deposit free from burning on the edges. Much less current is used in an acid copper solution than is employed in a cyanide copper solution.

Patent Abstracts.

958,384, May 17, 1910. METAL FURNACE Alfred Fisher of Chicago, Ill. This patent is upon a furnace for melting metal in crucibles and using oil for fuel. The specification is not upon the furnace itself, which is covered



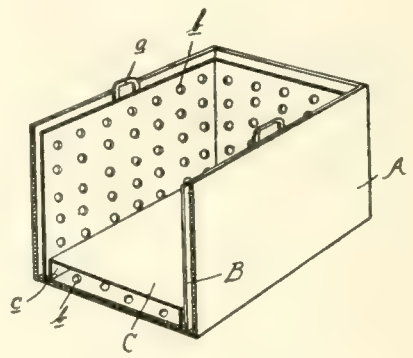
by a previous patent, but upon the manner of connecting a battery of furnaces so that each may be independently operated and controlled. Some minor improvements on the furnace are also claimed.

960,016, May 31, 1910. WIRE DRAWING MACHINE AND UNCOILING APPLIANCE THEREFOR. James A. Horton of Providence, R. I. Assignor to the Iriquois Machine Co. The object of this invention is to allow the wire to be drawn to pass through a lubricant in such a manner, before it reaches the die, that proper lubrication is obtained. This is accomplished by means of a swinging arm, through which the wire passes after it leaves the reel.

958,700 & 958,701, May 17, 1910. PROCESS OF BRIQUETTING ORE, FURNACE DUST, WASTE MATERIAL ETC. Max Glass of Vienna, Austria Hungary. The material is mixed with calcium acetate, aluminum sulphate and lime with a small amount of borax. The process is particularly applicable to briquetting iron or steel chips and similar materials that are apt to rust, thus saving metal.

961,674, June 14, 1910. METHOD OF HEATING AND MELTING METALS. Wm. N. Best of New York City. A reverberatory furnace for the melting or heating of metals and in which oil or other analagous fuel is used. The burner is a special feature of the furnace and is so constructed that a fan-shaped flame is produced over the molten metal thus preventing any "abrasive" effect, as it is termed by the inventor.

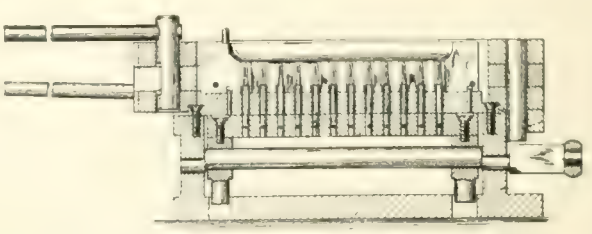
959,227, May 24, 1910. APPARATUS FOR REMOVING TARNISH FROM METALS. Marshall H. Kept of Chicago, Ill. The articles, such as silver plated ware, are immersed in a tank containing bi-carbonate of soda and made of enameled ware. They are



contained in a receptacle which may be easily removed, and while in the solution a plate of zinc is brought in contact with the articles. An electrolytic action is set up and the tarnish is removed from the plated ware. The zinc plate constitutes the anode and it may be readily removed and cleaned.

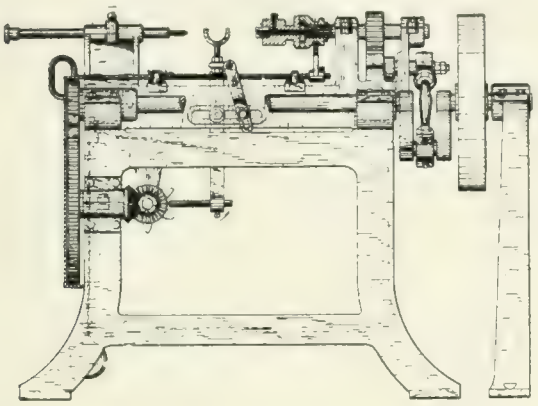
961,182, June 14, 1910. CASTING APPARATUS. Geo. H. Vining of Kansas City, Mo. A melting furnace, ladle and mold holder for use in lining journal bearings with soft metal. The ladle is supported on trunnions so that the bearing may be filled accurately and without spilling or waste of metal.

959,557, May 31, 1910. MACHINE FOR MAKING CASTINGS. Anthony Kribs of Brooklyn, N. Y. A mold for making a number of soft metal castings at once. The castings indicated are cast with a core and the



mold is so constructed that it is readily handled and opened for the removal of the castings. The inspection of the sketch will indicate the manner in which the mold is made.

959,506, May 31, 1910. MACHINE FOR GRINDING COCKS. Paul Gerstenkorn of Milwaukee, Wis. A machine for grinding gas-cock keys, plug-cock keys and other kinds of brass goods in which a ground joint is used. The cocks are ground by means of



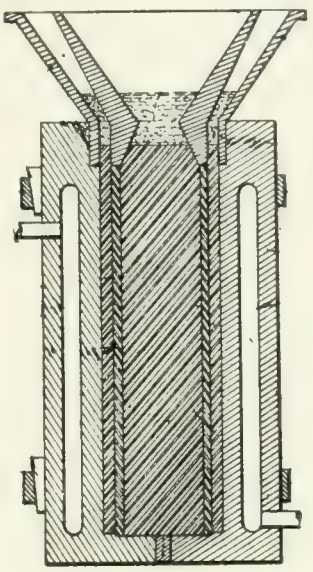
grinding spindles and a number may be ground at once. The attention of a single operator only is required. The novelty of the machine lies in the simplicity of the machine and its adaptability for grinding a number of cocks at a time.

958,180, May 17, 1910. METHOD OF PRODUCING TANTALUM. Johannes Schilling of Halensee, near Berlin, Germany. Assignor to Siemen & Halske Aktiengesellschaft of Berlin. It has been supposed that oxide of tantalum is not reduced by hydrogen while heated, but this inventor has found that by the use of a white heat and passing hydrogen gas over the oxide it is reduced to metal.

959,502, May 31, 1910. BUFFING MACHINE. John F. Gail of Kenosha, Wis. Assignor to the Simmons Mfg. Co. of Kenosha, Wis. A buffing machine for automatically buffing bent tubing or rods which are used on brass beds. It is particularly designed for buffing the bow-shaped pieces of brass tubing which form the top and foot frames of a brass bed.

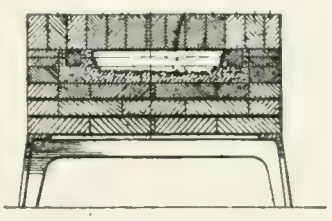
954,766—954,767, & 954,768. Apr. 12, 1910. ABRASIVE MATERIAL AND METHOD OF MAKING IT. Lewis E. Saunders of Niagara Falls, N. Y. Assignor to the Norton Company of Worcester, N. Y. A product containing approximately 92.5% of alumina, 3% of silica and 4.5% of titanium oxide is fused in an electric furnace without the presence of carbon. The result is an artificial abrasive. The natural oxide of aluminum and oxide of titanium are used.

960,372, June 7, 1910. COMPOUND METAL OBJECT. John F. Monnot, of New York City. Assignor to the Duplex Metals Co. of the same city. A method of making a steel coated copper wire for electrical purposes. Such wire is useful in certain instances as it is stiffer than a copper coated steel wire, is more heat resisting and has



many other valuable properties. The outside may also be tinned if desired for use with certain kinds of rubber insulation. The manner of making the wire is to coat a copper core with steel or vice-versa in the mold herewith illustrated, and then roll and draw into wire.

960,773, June 7, 1910. ELECTRIC FURNACE. Thaddeus F. Baily of Alliance, Ohio. A resistance furnace for heating. The resistance material is of a non-metallic nature and the feature of the furnace lies in the manner



it is constructed so that the heat may be evenly distributed and the resistance regulated so as to produce the required temperature.

961,449, June 14, 1910. WIRE DRAWING BLOCK. H. B. Humphrey of Joliet, Ill. Assignor to Humphrey & Sons of the same city. The feature of this invention lies in the use of compressed air for raising the wire block.

Trade Items.

The recently incorporated Atlanta Metal Bed Co., of Atlanta, Go., have purchased the factory of the Ware-Hatcher Furniture Co., manufacturers of iron beds, and will operate it.

The Stroh Die Molded Casting Co., 149-153 Michigan St., Milwaukee, Wis., manufacturers of die castings, is erecting a new building 100x120 feet and eight stories high.

The New York Metal Exchange have leased new quarters in the Trinity Building, 111 Broadway, New York City for a period of 10 years. The old Metal Exchange Building at Pearl St. and Burling Slip has been sold.

The Aluminum Castings Co., have purchased the plant of the Manitowoc Aluminum Co., of Manitowoc, Wis., and will operate it under the management of Conrad Wirra who has been president of the company. The Manitowoc Aluminum Foundry Co., has been in existence about 10 years.

F. E. Arthur, formerly of the F. E. Arthur Co., of Hartford, Conn., manufacturers of brass ingot metals, has started in the manufacture of the same product at East Hampton, Conn. He was at one time a member of the firm of Arthur Bros. of East Hampton, and who for many years manufactured yellow and red brass ingot metals.

The Lumen Bearing Co., of Buffalo, N. Y., are now sending out to their customers and the trade each month, their "Metal Report" which gives the prices of tin, copper, zinc, lead and antimony for each day of the month. In addition, a resumé of the metal situation is printed. This table is an accurate review of the metal conditions, and will be found a valuable thing in the brass foundry or other establishment that purchases metals.

George L. Wallace, formerly Eastern representative of the Dow Chemical Mfg. Co., is now representing the Harshaw, Fuller & Goodwin Co., of Cleveland, Ohio, in the East and will add to their goods a complete line of polishing and plating equipment such as dynamos, motors, tanks, polishing lathes, etc. No stock will be carried in the East but goods will be shipped from New York City. Mr. Wallace has opened an office in the Taylor Building on Cannon St., Bridgeport, Conn., and which will be his headquarters.

The Riverside Metal Works of Riverside, N. J., manufacture the celebrated "Guinea Gold Alloy" for use in making gold alloys. When this alloy is used, the gold is soft and ductile and a homogeneous mixture results that will not fire-crack. The color of the gold is also better when used. This company also manufacture "Omega" purified shot copper for use in making gold alloys or sterling silver. It is the ideal form for use in such work and is extensively employed for such purposes by the leading gold and silversmiths.

The new brass foundry to be erected by the Fairbanks-Morse Co., at their plant in Beloit, Wis., is to be 70x175 feet.

J. H. Zimmerman has resigned his position as superintendent of the plant of the Lamson Consolidated Store Service Co., at Lowell, Mass., and is now connected with the Timken Roller Bearing Co., of Canton, Ohio, as factory manager.

Hermann Gruener, formerly with the Wm. A. Rogers Co., Ltd. of Niagara Falls, N. Y., has started a factory at 535 Tenth St. in that city to carry on die sinking, metal spinning, and the manufacture of silver and other novelties.

The Reinhold Noflux Aluminum Solder Co. 610 Union Bldg., Newark, N. J., have successfully soldered a large variety of die castings by means of their solder and without the use of a flux. As well known, die castings, on account of the aluminum that they contain, are quite difficult to solder in the ordinary way, but by means of the Reinhold Noflux Solder, the operation becomes simple.

The Mau-Sherwood Supply Co., 1616 West 3rd. St., Cleveland, Ohio, jobbers and manufacturers of automobile supplies, are now carrying a complete line of supplies for the plating, polishing and brass foundry trades. This new department will be in charge of W. A. MacFarland, formerly of the MacFarland-Snyder Co., of that city and whose familiarity with the trade is such that customers will receive careful attention in regard to their wants.

The Driver-Harris Wire Co., of Harrison, N. Y., are now manufacturing pure nickel in the form of sheet, wire and ribbon for the trade. They also manufacture "Monel" metal in the same forms and customers who have been unable to obtain these materials in satisfactory condition and sizes, should correspond with the Driver-Harris Company as they are now making a specialty of them. In addition to these metals they manufacture all kinds of fine wire for various purposes and special resistance wires for electrical work.

Much interest has been manifested in the silver trade about the report that Dr. F. W. Lange of Scranton, Pa., is able, by means of 8 oz. of silver and 48 cents worth of chemicals, to produce 16 oz. of silver. The usual newspaper reports have been widely read and like many other similar metallurgical "discoveries" there has been much conjecture about the ultimate result. If one would stop to think, it would readily be seen what the outcome of such a process would be. All the silver necessary would be, say 1 oz. for the start. With this he could make 2 oz. With 2 oz., 4 could made and so on in geometrical progression. It is strange, therefore, that the inventor is obliged to purchase silver.

The Eagle Brass Mfg. Co., of Carlstadt, N. J., are erecting a new brass foundry and equipping it with four Berkshire molding machines supplied by W. H. Nichols, 30 Church St., New York City.

The Dodge Plating Works have started in business at 3 Appleton St., Boston, Mass., and are carrying on all kinds of plating, polishing and finishing. A specialty is made of the repairing automobile lamps and radiators. Light machine work is also carried on.

The Crouse-Hinds Co., of Syracuse, N. Y., manufacturers of electric goods and fittings, are about to install an electrogalvanizing plant for electrogalvanizing iron and steel parts of their products. Heretofore they have not used this process except to a limited extent.

The Basic Mineral Co., of Pittsburg, (north side), Pa., are placing on the market a new flux for use in melting brass and bronze and called "Radioclarite." It is claimed that it is particularly efficacious in cleaning dirty scrap metals, such as sweepings or skimmings. It is recommended for all kinds of copper alloys.

The International Acheson Graphite Co., of Niagara Falls, N. Y., manufacturers of artificial graphite are now placing on the market a product known as "Aquadag" that is very useful as a lubricant. It is a graphite liquid but in which the graphite is so fine that it will pass through a fountain pen. One of the uses for the material is in the cutting of threads on tough material, such as wrought iron.

The Balbach Smelting & Refining Co., of Newark, N. J., makers of the N. B. B. Brand of copper ingots, announce to the trade that they are now manufacturing a particularly high grade brass and composition ingot for the brass foundry trades. Their extensive facilities for smelting and refining of copper and copper bearing materials will prove valuable in the manufacture of these ingot metals, and their laboratory and testing departments will also serve to guarantee the quality of the product. The Balbach Smelting & Refining Co., are also buyers of all kinds of copper bearing materials.

The Wolff-Trautz Company Inc., has been organized in Newark, N. J., by John B. Wolff who has been in the smelting and refining business in that city for many years. The capital stock of the new company is $50,000 and in addition to Mr. Wolff, C. C. and Augustus L. Trautz are interested. A large building, three stories high, has been erected at 9-11 Delancy St., Newark, and the smelting and refining of gold and silver, sweeps, wastes etc., will be carried on. A specialty will be made of platinum wastes. Later silver solders, silver alloys and gold and silver castings will be made for the trade. John B. Wolff is the president and manager, and A. C. Trautz is the secretary and treasurer.

The Saugatuck Mfg. Co., have succeeded H. J. Gibbs at 187 St. John St., New Haven, Conn., and are carrying on job plating at the same address.

The American Wire Brush Co., 277 Greenwich St., New York City, manufacturers of brushes for the electroplating and metal trades, are sending out a new twenty section catalogue describing the various kinds of brushes which they manufacture.

A new and large plant is to be built by the C. G. Conn Mfg. Co., of Elkhart, Ind., to replace the one recently destroyed by fire. This company is the largest manufacturer of brass band instruments in the United States.

A. Griffoul & Bro., of 290 Chestnut St., Newark, N. J., manufacturers of fine castings, announce that they have discontinued the making of gold and silver castings as the business is so small that it was not considered profitable. Hereafter they will confine their work to larger castings.

George N. Hall of Pewaukee, Wis., manufacturer of hardware specialties, is to move his factory to Council Bluffs, Iowa, where a new factory will be built. A new electroplating plant for copper, brass, nickel and silver plating will be equipped and electrogalvanizing will be done. Automatic wire forming machines will also be installed.

A circular is being sent to the trade by the Vernon Metal Co., Hudson Terminal Bldg., New York City which is a reprint of a similar one sent by A. Auerbach of Hamburg, Germany, whom they represent, announcing that a new metal exchange has been started in Hamburg and that only copper and tin are dealt in. A. Auerbach, through the Vernon Metal Co., is prepared to take orders for execution upon the exchange in Hamburg.

The Lundhaven Brass Foundry Company, recently incorporated by Frank P. Lund and others in Buffalo, N. Y., to make brass and aluminum castings are now located at 41 to 45 Letchworth St., Geo. W. Morris is the president; Frank P. Lund, vice-president; and J. Gordon Rappell, secretary and treasurer. Frank P. Lund was formerly superintendent of the Lumen Bearing Co., of Buffalo, and will act as works manager of the new company. A specialty of manganese-bronze castings will be made.

The John H. Robinson Foundry recently started by John H. Robinson at 45 Dewey Court, Bridgeport, Conn., is now in operation and manufacturing has commenced. A number of crucible furnaces for melting have been installed, and more will be added later. The manufacture of a very high grade of aluminum castings, both in sand and in metal molds, is being carried on. One of the specialties is aluminum solder for which a special mixture is used. Mr. Robinson was formerly general manager of the Fairfield Aluminum Foundry of Fairfield, Conn.

The West Side Foundry of Watervliet, N. Y., have recently started an electroplating plant at their works.

The Nora Metal Works has been started at 211 Hanover St., Baltimore, Md., and is manufacturing bells.

The Mott Wheel Works of Utica, N. Y., manufacturers of automobile wheels and rims, are installing a new electrogalvanizing plant for electrogalvanizing steel wheel rims.

W. G. Jones, formerly in charge of the brass foundry of the Lowell Machine Shops of Lowell, Mass., has taken charge of the new aluminum foundry of the Fairview Foundry Company, foot of Vanilla Ave., Detroit, Mich.

The Baird Machine Co., of Oakville, Conn., are sending out to the trade their Bulletin No. 107 describing their "Baird No. 1 Tool and Die Grinder" that is a very useful appliance in any metal working factory.

The Dominion Stamping Co., Ltd. has been incorporated in Walkerville, Canada with a capital stock of $100,000 and will erect a plant for the manufacture of automoible stampings, hoods, tanks and will also make stove trimmings.

The Norton Company of Worcester, Mass., manufacturers of abrasive wheels, are about to build a plant at Chippewa, Ontario for the manufacture of artificial abrasives by the electric furnace method. A plant of this description is now being operated at Niagara Falls, New York.

B. F. Cramp, an expert employed in the factory of Champenois & Co., of Newark, N. J., manufacturers of jewelry, was recently injured at their factory by an explosion of fulminate of gold and may lose his eyesight. He had handled the fulminate for over twenty years without accident.

W. R. Webster of the Bridgeport Brass Co., Bridgeport, Conn., C. P. Karr of the Nathan Mfg. Co., of New York City, and F . O. Clements of the National Cash Register Co., of Dayton, Ohio have been appointed as the committee on papers for the American Brass Founders' Association for next year.

Charles F. L. L'Hommedieu & Sons. Co., 26 South Clinton St., Chicago, Ill., manufacturers of electroplaters' supplies and equipment have taken additional space adjoining their plant in order to keep pace with their growing business. They recently brought out their new No. 9 polishing lathe and which will be found adapted for a large variety of work.

The Anthony Company, 45 West 34th St., New York City, manufacturers of oil burning crucible furnaces and "Nebulyte" oil burners, have issued their first Bulletin illustrating and describing their furnace and burner and which will be sent to those who desire it. The Detroit Foundry Supply Co., of Detroit, Mich. are their Western representatives. This furnace, as well known, has many novel features, and is practically noiseless.

The Nelson Valve Co., of Chestnut Hill, Philadelphia, Pa., are building a foundry for making Monel-metal castings and other special alloys used in valve work.

The new plating plant of the Eastman Kodak Co., of Rochester, N. Y., is now in operation and is one of the most modern in the United States.

The Edna Smelting Works of Cincinnati, Ohio, smelters and refiners of scrap metals and also manufacturers of babbitt-metal and similar white alloys, are to erect a new building at a cost of $100,000.

The Detroit Foundry Supply Co., of Detroit, Mich., and Windsor, Canada, are sending to the trade their Catalogue No. 2 on fire-brick and other refractory material. It will be sent to those interested.

The J. W. Paxson Company of Philadelphia, manufacturers and dealers in foundry supplies, have increased their factory on Beach St., by additions to the building and a new 50 H. P. engine.

W. E. Crist, formerly president and general manager of the Crist Valve Co., of Chittenango, N. Y., has become associated with the O. M. Edwards Co., Syracuse, N. Y., in the capacity of general manager of their new valve department.

The name of the Saco & Pettee Machine Shops of Newton Upper Falls, Mass., and Biddeford, Maine and operating a brass foundry at the latter place, have changed their name to the Saco-Pettee Co., and the capital stock has been increased to $1,600,000. Textile machinery is manufactured.

The Roessler & Haaslacher Chemical Co., 100 William St., New York City, manufacturers of cyanide, chemicals and metallurgical products, are to construct a new plant at Perth Amboy upon which $400,000 will be spent. The buildings will be of modern fireproof construction.

The Electrical Alloy Co., of Morristown, N. J., manufacturers of special bronze, German-silver, nickel and nickel alloy, aluminum, steel and steel alloy wires, have recently installed some new continuous machinery for fine wire drawing and which will give them an increased output.

The Crown Electrical Mfg. Co., of St. Charles, Ill., manufacturers of electrical and gas fixtures and electrical supplies, are about to establish a factory in Canada for taking care of their business in that country. The factory is to be located in Brantford, Ont., and will be erected at once.

The Light Mfg. Co., of Pottstown, Pa., manufacturers of aluminum castings, are preparing to take over the plant of the Chadwick Engineering Co., of that city when the new plant of the latter company is completed. The Light Mfg. Co., have needed additional facilities for some time and this acquisition will give them the necessary room.

At the annual meeting of the Joseph Dixon Crucible Co., held in June, the old officers and board of directors were re-elected.

The Chadwick Engineering Co., of Pottstown, Pa., manufacturers of automobiles, have acquired 12 acres of land in that city and will erect a large plant.

Work on the new brass foundry of the East Moline Brass Works of East Moline, Ill., is progressing and the building will shortly be ready.

The Comet Electric Stove Co., has been incorporated in Detroit, Mich., with a capital stock of $50,000 to manufacture electric stoves, cookers and heaters.

The Corry Metal Furniture Co., of Corry, Pa., which was recently organized with a capital stock of $50,000 to manufacture metal furniture has now purchased a site and will erect a plant for manufacturing.

The Interior Metal Mfg. Co., has been incorporated in Jamestown, N. Y., with a capital stock of $50,000 to manufacture metal furniture. A factory will be erected. The organizers were formerly connected with the Art Metal Construction Co., of that place.

A plant for the manufacture of stoves is to be built by the Charter Oak Stove & Range Co., on Thatcher St., St. Louis, Mo. The buildings will be one story high and the cost is estimated at $108,000. The plant is now located on Main St., and Cass Ave.

The plant formerly occupied by the Buffalo Steel & Shafting Co., at Baltz Ave., and Erie R. R., Buffalo, N. Y., has been purchased by the J. W. Pohlman Foundry Co., of that city, manufacturers of stoves. A new addition is to be built and new grinding and polishing equipment is to be installed.

A new plant for the manufacture of sheet lead and lead pipe is to be built by the United Lead Company, 100 Broadway, New York City. It is expected that the rolling mill be 40x300 feet. This company owns a controlling interest in the United States Cartridge Co., of Lowell, Mass.

The Wilder Metal Coating & Mfg. Co., of Connellsville, Pa., manufacturers of sheet steel coated with a patent aluminum alloy, have installed a new dipping tank with a capacity of 20 tons of coated sheets per day. Sheets coated with their aluminum alloy are smooth and white, and in this respect differ from ordinary galvanized iron.

R. F. Lang, 31 Broadway, New York City, the well known importer of the Royal Brand of phosphor-copper, phosphor-tin, manganese-copper, etc. has returned from his annual trip abroad and reports that the Royal works are exceptionally busy. He has also acquired the agency for "Atlas Lead Cement" which is now being used extensively abroad in place of lead for anchoring machinery, pipe connections etc. It is much cheaper than lead for this purpose.

The Eclipse Mining Co., of Louisville, Ky., have opened a large fluor-spar deposit in Crittenden county, Ky.

An addition to the brass foundry of the Youngstown Bronze & Iron Foundry Co., at Youngstown, Ohio is to be made.

The Pneumatic Scale Corp. of Norfolk Downs, Mass., manufacturers of automatic weighing machines, are building an addtion to their plant.

The Paterson Automobile Co., Flint, Mich., manufacturers of automobiles, are to locate a factory in Windsor, Canada to take care of their Canadian trade.

The National Gauge & Register Co., of Minneapolis, Minn., manufacturers of automobile accessories, are to open a branch plant in La Crosse, Wis.

The Syracuse Pattern Works of Syracuse, N. Y., have been incorporated with a capital stock of $10,000 to make wood and metal patterns. A foundry will also be started.

An addition of $100,000 has been made to the capital stock of the Michigan Stove Co., of Detroit, Mich., making the total capital stock now $1,600,000.

The new plant to be erected by the Voelkner & Harry Mfg. Co., of Detroit, Mich., to replace the one destroyed by fire, will be at the corner of First & Larned Sts., and will be 100x120 feet and two stories high. This company manufacture hardware specialties.

James Cunningham & Son Co., of Rochester, N. Y., the well known carriage builders, are erecting a building in Chicago, Ill., which will be used for a automobile manufacture and storage. This company recently commenced the manufacture of automobiles in addition to their regular line of carriages.

C. W. Leavitt & Co., 30 Church St., New York City, are sending out to the trade, a folder giving a list of the various metals and ores that they handle. They are now handling some special alloys of value to the trade. Among them are vanadium-copper, silicon-chromium, silicon-copper, silicon-manganese-aluminum, etc.

Walsh's Sons & Co., 295 Passaic St., Newark, N. J., manufacture ingot brass for the trade and have a fine quality of aluminum scrap constantly on sale. Old materials of all kinds are also bought or sold. When in the market for woolen or cotton waste, machinery, belting, pulleys, hangers, etc., they will be pleased to quote prices.

The Goldschmidt Thermit Co., 90 West St., New York City, makers of Thermit and metals reduced by the Goldschmidt process, are sending out to the trade the second quarterly issue of their pamphlet entitled "Reactions" which is filled with interesting information. It is illustrated with numerous cuts showing welded metal and the manner of doing it.

Current Metal and Supply Prices.

These Prices are net and are for moderate quantities. Smaller quantities command higher prices. Prices subject to fluctuation.

Acetone, pure, 98-99%	lb.	.22
Acid, Acetic, pure, 30%	lb.	.07
Acid, Arsenious (White Arsenic)	lb.	.20
Acid, Benzoic	lb.	.55
Acid, Boracic (Boric), pure	lb.	.12
Acid, Hydrochloric, see Acid, Muriatic.		
Acid, Hydrofluoric, 30%	lb.	.04
Acid, Hydrofluoric, 50%	lb.	.10
Acid, Muriatic, 20°	lb.	.02
Acid, Muriatic, c. p., 20°	lb.	.07
Acid, Nitric, 38°	lb.	.05⅝
Acid, Nitric, 40°	lb.	.05⅞
Acid, Nitric, 42°	lb.	.06¼
Acid, Nitric, c. p.	lb.	.08
Acid, Sulphuric, 66°	lb.	.01¾
Acid, Sulphuric, c. p.	lb.	.06
Alcohol, Wood	gal.	.50
Alcohol, Denatured	gal.	.55
Alum	lb.	.04
Aluminum, Sulphate	lb.	.06
Aluminum, Metallic, in Ingots	lb.	.23
Aqua-Fortis, see Acid, Nitric.		
Ammonia Water (Aqua-Ammonia), 20°	lb.	.04¾
Ammonia Water (Aqua-Ammonia), 26	lb.	.06¼
Ammonia Water, c. p.	lb.	.08
Ammonium Carbonate, lump	lb.	.15
Ammonium Chloride (Sal-Ammoniac)	lb.	.12
Ammonium Hydrosulphuret	lb.	.30
Ammonium Sulphate	lb.	.07
Ammonium Suphocyanate	lb.	.50
Amyl Acetate	gal.	1.85
Antimony	lb.	.08¼
Arsenic, Metallic	lb.	.15
Arsenic, White (Acid Arsenious)	lb.	.20
Argols, White (Cream of Tartar)	lb.	.31
Asphaltum, Commercial	lb.	.05
Asphaltum, Egyptian (Bitumen)	lb.	.30
Benzine	gal.	.15
Benzol, Pure	gal.	.75
Bismuth, Metallic	lb.	1.75
Bitumen, see Asphaltum.		
Blue-Vitriol, see Copper Sulphate.		
Borax, Crystals or Powdered	lb.	.10
Borax Glass	lb.	.35
Cadmium, Metallic	lb.	.70
Carbon Bisulphide	lb.	.10
Calcium Carbonate (Precipitated Chalk)	lb	.10
Chrome-Green	lb.	.50
Copper, Lake, (carload)	lb.	.12¾
Copper, Lake, (cask)	lb.	.13
Copper, Electrolytic, (carload)	lb.	.12½
Copper, Electrolytic, (cask)	lb.	.12¾
Copper, Casting, (carload)	lb.	.12⅜
Copper, Casting, (cask)	lb.	.12⅝
Copper Acetate (Verdigris)	lb.	.35
Copper Carbonate, dry	lb.	.25
Copper Sulphate (Blue-Stone)	lb.	.09
Copperas, see Iron Sulphate.		
Corrosive Sublimate, see Mercury Bichloride.		
Cream-Tartar, see Potassium Bitartarate.		
Cryolite	lb.	.12
Cyanide, see Potassium Cyanide.		
Dextrin	lb.	.15
Emery Flour	lb.	.04
Emery, F F & F F F	lb.	.03
Flint, powdered	lb.	.01
Fluor-Spar	lb.	.01¼
Fusel-Oil	gal.	1.75
Gold Chloride	dwt.	.60
Gum Copal	lb.	.30
Gum Guiacum	lb.	.26
Gum Mastic	lb.	.70
Gum Sandarac	lb.	.35
Gum Shellac, brown	lb.	.50
Gum Shellac, white	lb.	.60
Iron Perchloride	lb.	.25
Iron Sulphate (Copperas)	lb.	.05
Lead Acetate (Sugar of Lead)	lb.	.15
Lead, Pig	lb.	.04½
Lead, Red	lb.	.12
Lead, Yellow Oxide (Litharge)	lb.	.12
Liver of Sulphur, see Potassium Sulphide.		
Manganese, Ferro, 80%	lb.	.10
Manganese, Metallic, pure	lb.	.75
Magnesium, Metallic	lb.	1.50
Mercury Bichloride (Corrosive Sublimate)	lb.	.93
Mercury, Metallic (Quicksilver)	lb.	.50
Mercury Nitrate	lb.	1.50
Mercury Oxide, yellow	lb.	1.80
Nickel and Ammonium Sulphate (Double Salts)	lb.	.16
Nickel Carbonate, dry	lb.	.60
Nickel Chloride	lb.	.50
Nickel Metallic	lb.	.47
Nickel Sulphate (Single Salts)	lb.	.25
Nitre (Saltpetre), see Potassium Nitrate.		
Oil of Vitriol, see Acid, Sulphuric.		
Paraffine	lb.	.15
Phosphorus, yellow	lb.	.40
Phosphorus, red	lb.	1.10
Pitch	lb.	.05
Plaster of Paris, Dental	bbl.	4.00
Platinum Chloride	oz.	14.50
Platinum Metallic	oz.	32.00
Potash-by-Alcohol, in sticks	lb.	.50
Potash, Caustic (Potassium Hydrate)	lb.	.08
Potassium Bichromate	lb.	.14
Potassium Bitartarate (Cream of Tartar)	lb.	.31
Potassium Carbonate (Pearlash)	lb.	.10
Potassium Chlorate	lb.	.15
Potassium Cyanide	lb.	.25
Potassium Iodide	lb.	2.25
Potassium Nitrate (Nitre or Saltpetre)	lb.	.10
Potassium Permanganate	lb.	.17
Potassium, Red Prussiate	lb.	.60
Potassium, Yellow Prussiate	lb.	.24
Potassium Sulphide (Liver of Sulphur)	lb.	.15
Potassium Sulphuret, see Potassium Sulphide.		
Potassium Sulphocyanate	lb.	.70
Pumice, Ground	lb.	.05
Quartz, Powdered	lb.	.01
Rosin, Yellow	lb.	.04
Sal-Ammoniac, see Ammonium Chloride.		
Sal-Soda, see Sodium Carbonate.		
Silver Chloride, dry	oz.	.75
Silver Cyanide	oz.	1.00
Silver, Fine	oz.	.53½
Silver Nitrate, crystals	oz.	.50
Soda-Ash	lb.	.05
Sodium Biborate, see Borax.		
Sodium Bisulphite	lb.	.15
Sodium Carbonate (Sal-Soda), crystals	lb.	.02
Sodium Hydrate (Caustic Soda)	lb.	.05
Sodium Hydrate (Caustic Soda) by Alcohol (in sticks)	lb.	.45
Sodium Hyposulphite ("Hypo")	lb.	.04
Sodium Metallic	lb.	.90
Sodium Nitrate	lb.	.05
Sodium Phosphate	lb.	.09
Sodium Silicate (Water-Glass)	lb.	.04
Soot, Calcined	lb.	.15
Spelter, see Zinc.		
Sugar of Lead, see Lead Acetate.		
Sulphur (Brimstone) in lump	lb.	.05
Tin Chloride	lb.	.43
Tin, Metallic	lb.	.33
Turpentine, Venice	lb.	.35
Verdigris, see Copper Acetate.		
Water, Distilled	gal.	.15
Water-Glass, see Sodium Silicate.		
Wax, Beeswax, yellow	lb.	.45
Wax, Carnauba	lb.	.70
Whiting (Ground Chalk)	lb.	.02
Zinc Carbonate, dry	lb.	.19
Zinc Chloride	lb.	,12
Zinc, Sulphate	lb.	.06
Zinc, (spelter)	lb.	.05⅜

THE BRASS WORLD AND PLATERS' GUIDE

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The Elastic Limit of Manganese-Bronze.

In supplying manganese-bronze to our Government and other large consumers, either in the shape of ingots or castings, specifications have been issued calling for certain physical characteristics without paying any attention to the question of mixture. The physical qualities have been the only ones that must be met; and as long as the specifications in this respect were lived up to, no attention has been paid to the chemical qualifications. This could not be otherwise and has been satisfactory.

With good manganese-bronze little difficulty is experienced in meeting the specifications for the physical qualities, with the exception of the elastic limit, and this has always been the objectionable feature. The tensile strength in many instances has been found to be far in excess of the requirements, the elongation and reduction in area could readily be obtained, but when the matter of elastic limit was brought up, it was a subject of bitter criticism and has often resulted in the rejection of castings or ingots on account of the apparent low result of the testing machine operator. When these conditions are taken into consideration it is a pleasure to note that a series of investigations (see article in this issue) have been undertaken by one engineer in the endeavor to show that the ordinary method of obtaining the elastic limit in the bronzes is unsatisfactory and gives too high a

result. For many years, the maker of strong bronzes has been obliged to suffer for the errors of methods and, we may say, has been subject to the caprices of the testing machine operator.

It has been well known for a long time that the elastic limit in bronzes is not well defined and unless some absolute method is used for obtaining it, large errors will certainly creep in. The so-called "divider" method, as practiced with iron and steel, is unsuited for the bronzes. The Government specifications have called for 30,000 lbs. per sq. in. elastic limit, and the aforesaid investigator has found that by means of the plotted curve method, it was impossible to obtain over 23,000 lbs. per sq. in. elastic limit and a number of tests in which the other physical characteristics were met, it was from 16,000 to 19,000 lbs. When the "divider" method was used, the elastic limit varied from 25,000 to 29,000 lbs. per sq. in.

In issuing specifications for manganese-bronze, therefore, it is evident that the method of determining the elastic limit shall be given, or to abolish it altogether.

Need for Better Rheostats in the Plating Trade.

The rheostat (frequently, although erroneously, called "the switch") as found in the average electroplating establishment is rather an inefficient tool, when its actual value to the plater is concerned. It may be well made, as it usually is, but it is rarely adapted to the work intended for it. Our own experience with the average rheostat used is that much of the poor work produced is caused by the use of one not adapted for the work. The difficulty is quite noticeable in the case of a brass solution where it is imperative that a rheostat be used of "long range" in order to obtain the necessary current density in the tank and thus obtain the desired brass color. When the current is not properly regulated, blistering, a hard deposit or an unsatisfactory color is obtained. In the electrodeposition of metals there is always one current density that is capable of producing good results, and others in excess or below will not give as satisfactory a deposit. To obtain this "standard" density, either the voltage of the dynamo must be exactly that required to produce the necessary current density in the tank, or, if this voltage is in excess of what is required, the current strength must be cut down to the required amount by a suitable rheostat. As it is rare indeed, that a dynamo is constructed to give the desired voltage required in plating, and it is generally greatly in excess, the use of the rheostat is the customary method of cutting down the current.

One rheostat cannot be made to answer for all work, but it must be made for each special case. The voltage of the current, the number of amperes to be carried, and the number of "steps" desired must be known in order to render it serviceable. If platers would supply this data when ordering a rheostat and not use one taken at random, it would be found that much better work will be produced. Many a rheostat is of no value to its owner for the reason that it does not cut down the current to the necessary degree; and many a plater has been unable to do brass plating successfully on this account. We believe the day is coming when much more attention will be paid to this heretofore neglected portion of plating equipment, so that it will not be necessary, as it now frequently is, to resort to many hundreds of feet of iron or German-silver wire coiled around the tank or room. If those who believe a rheostat is not an important feature, could visit a modern electrochemical laboratory and note the fine adjustments that can be obtained in current regulation, a change would take place.

Profits in the Manufacture of Cyanide.

Consul-General Richard Guenther writes from Frankfort that the *Deutsche Gold and Silber Scheide Anstalt,* capital, 10,000,000 marks (mark=23.8 cents), reports 5,803,500 marks net profits for its fiscal year 1909-10, of which 36 per cent was paid in dividends. The company's Frankfort factories produce ceramic colors, synthetic indigo, and other chemicals, and its new cyanide and electrochemical works have yielded good results. Its enterprises in the United States, the Roessler & Hasslacher Chemical Company and Niagara Electro-Chemical Company increased their profits, while its chemical works at Perth Amboy,- N. J., earned less, owing to competition.

The Season Cracking of Brass Tubing and Sheet by Ammonia.

One of the most annoying things that happens to brass while in use is its season cracking. It rarely happens in the brass rolling mill; but after it has reached the customer and has been in use for a greater or less length of time, it is quite aggravating to have the customer attempt to place the blame upon the manufacturer. While in some instances the season cracking of brass may be laid at the door of the manufacturer, in the majority of instances it is not his fault; outside agencies have been responsible for it.

Bad cases of cracking are frequently encountered when ammonia water is used, either on the inside or outside of brass tubing. In Fig. 1 are shown pieces of seamless brass tubing which came in contact for some time with ammonia water. In this case the tubes (which were hard drawn and consisted of 2 and 1 brass) were badly cracked and crystallized. The fracture at the broken portions showed a strongly crystallized metal. The tubes were not corroded badly, although patches of a green substance were distributed over the surface.

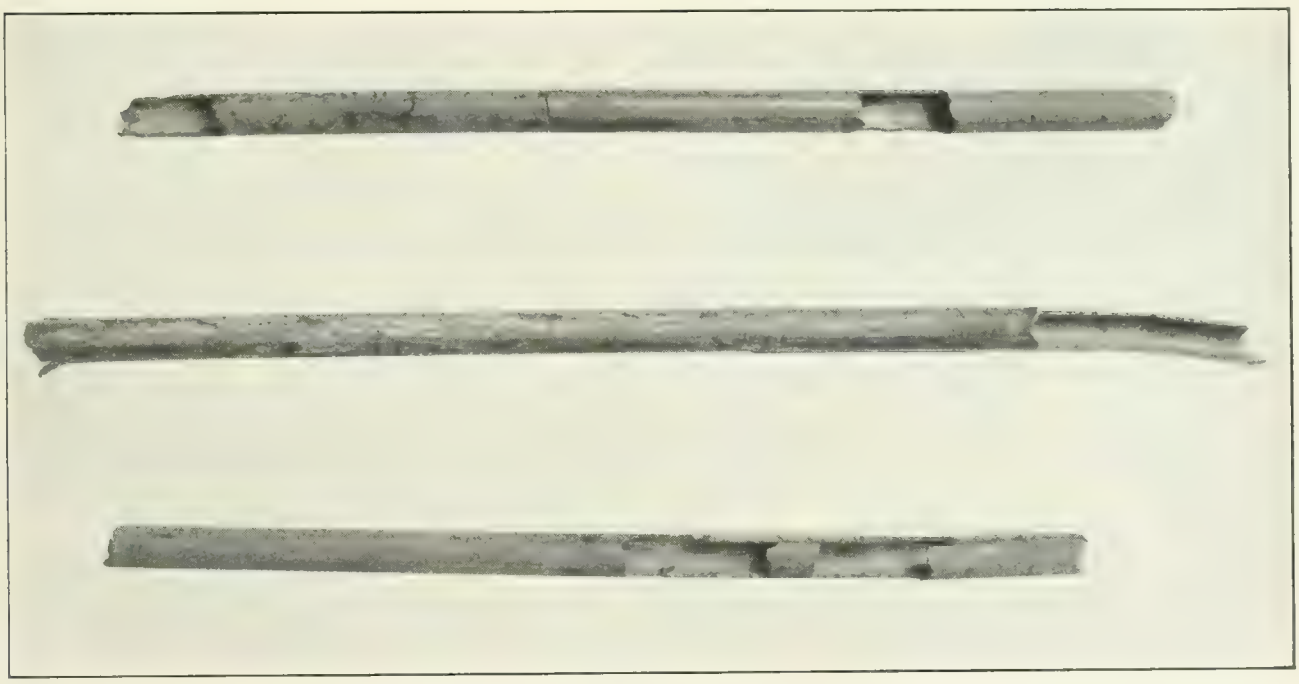


Fig. 1. Seamless Brass Tubing Showing the Effect of Ammonia in Producing Season-Cracking.

One of the most frequent sources of the season-cracking of brass is its contact with ammonia. Not only will ammonia water produce it, but various other substances such as urine, animal excretions, or other matter which evolves ammonia upon decomposition. If the brass is placed in a location where such matter can come in contact with it, no matter how good it may be, it will surely season crack.

Why the ammonia should act in this manner is not understood. It certainly is not caused by the dissolving out of the zinc, like that which occurs in the deterioration of condenser tubing. To indicate that this is not the case, many instances are known in which brass tubing or rod has season-cracked by coming in contact with animal excreta, and yet the brass was only superficially attacked and the metal underneath was sound.

In Fig. 2 a rather unusual instance of the effect of ammonia in the cracking of brass is shown. The cracking took place in the brass sheet used in the acetylene generator in which calcium carbide and water were used for generating the gas. Owing to impurities in the calcium carbide, ammonia is formed during the decomposition so that it can be smelled in the tank. At the top corner of the tank on the outside, the brass was badly cracked and cracks had begun to form in other portions. The cracks all began at the top where the ammonia seemed to be present to a great-

er extent and extended downwards. They also started from the inside so that some of them are not visible in the photograph. The case

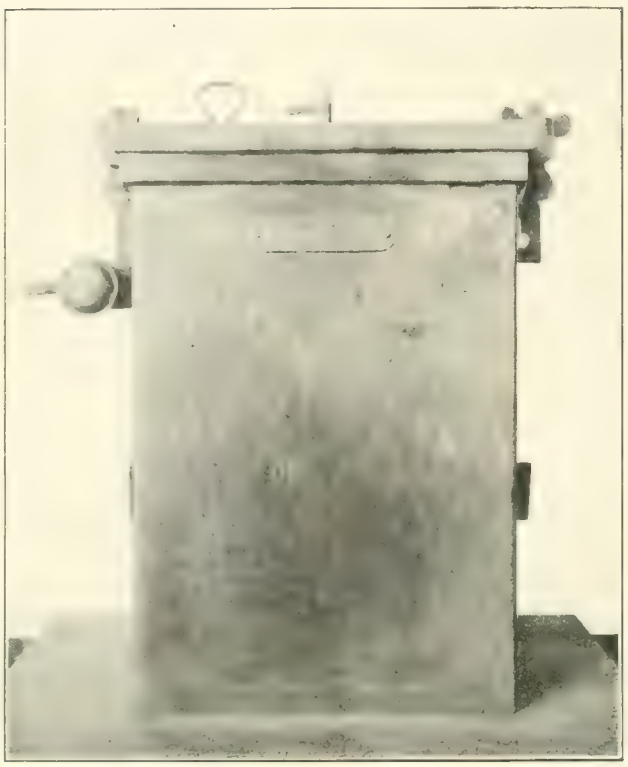


Fig. 2. Brass Acetylene Generator Which Season-Cracked on Account of Ammonia Generated by the Calcium Carbide.

of cracking was undoubtedly one caused by the ammonia.

Standardizing Molding Flasks.

A correspondent sends us a communication in which he advocates the standardizing of flasks used in molding brass work so that the location and size of pins of any one size flask would be exactly the same. As an illustration he cites the case of a pattern mounted on a match plate for a 12 in x 16 in. flask. If the pin holes are drilled to fit a certain make of flask, the patterns cannot be used when so mounted in any other make of flasks. If the flasks were standardized so that the holes were uniform in size and distance apart, the same pattern could be utilized wherever it was desired to send them. He also believes that the American manufacturers are backward in standardizing their work of all kinds.

While this suggestion, when carried out, would be a good one for the customer, it would be quite difficult to accomplish as brass founders are more apt to look with favor upon any condition that will serve to keep trade to themselves, rather than to make it easy for their competitors. If patterns are made so as to fit a brass founder's flasks, he is more certain of keeping the trade, provided, of course, he makes good castings, than would be the case were the pattern adapted to the flasks of every brass founder. To standardize flasks in the manner our correspondent suggests would render it a simple matter for a customer to take his patterns away from one brass foundry on one day, and turn his trade to a competitor the next; and still have orders filled without delay.

It has always been one of the methods of founders, both iron and brass, to maintain certain methods of molding, gating or metal mixing as trade secrets. We have found, time and time again, brass founders, who have had patterns sent to them that were unsuitable for the work intended to be cast, to make a new gate of patterns without the knowledge of the customer, so that when another founder attempted to make them from the original pattern, he would not succeed and would attempt to force the customer to make a new pattern adapted for the work. The result, however, was that the first founder who was wise enough to make a new gate, would again obtain the work. Such conditions are particularly true in cases of price competition and not quality. We believe that this same condition will exist if attempts are made to standardize the molding flasks as our correspondent suggests. While it is a subject that would benefit the user of castings, we fail to see how a brass founder would gain by it when the present condition of the business is taken into consideration.

Much concern is now being manifested in England on account of the discovery that the bell called "Big Ben" has developed a crack which impairs the tone. This bell is one of the largest in the world and weighs over 13 tons. It is hung in the tower of the House of Parliament and can be heard for nine miles.

Experiments have now demonstrated the fact that the cause of the rapid rusting of steel and iron in the form of sheets, wire, rods or tubing, is caused by the presence of impurities. By the elimination of manganese and other foreign elements in the iron, it has been found that it will withstand corrosion to a far greater degree.

A Simple Method of Making a Bronze Plating Solution.

The electrodeposition of bronze is now extensively carried on, particularly in the builders' hardware trade, as the demand for imitation and *cheap* bronze goods is now greater than ever before. Such a condition is brought about by the rapidly increasing use of sheet steel, stamped into various articles and which, when bronze plated, closely resemble solid bronze at a great decrease in cost. As bronze plating can be done as cheaply and as easily as copper plating, and requires no preliminary deposit, the only reason for the fact that it is not used even more extensively is the lack of knowledge on the part of many platers of the method of making and working the plating solution. When this method is known, bronze plating is quite simple and requires only a little more attention than a copper solution in manipulation. It is easier to run than a yellow brass solution.

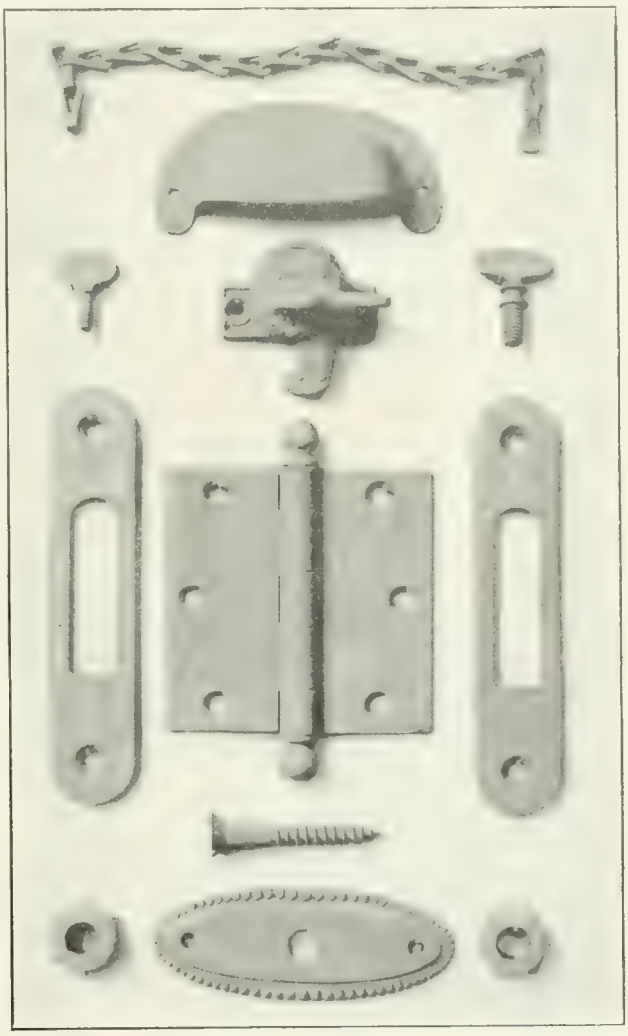
The term *bronze* as now employed in technical literature, is used to designate any metal with a *bronze color*. At one time, it was used to designate only an alloy of copper and tin, but now this usage has become obsolete and the only requirement seems to be that the metal shall have the well known bronze shade. While the copper and tin bronzes have the best color, those which are obtained by copper and zinc alone so closely resemble it, are cheaper and in electroplating are so much easier to work, that they are almost exclusively employed. They are the ones used in producing the bronze plated hardware and similar articles, and it is such a solution that will be described.

Copper and Zinc Only Used

As previously mentioned, copper and zinc only are used in making up a bronze plating solution as now employed for commercial work. *The use of tin is not to be recommended* except for obtaining special shades. It renders the solution more difficult to run, is more expensive and more difficult to make up. Few bronze platers are now found who use tin in their solutions, and those who are doing the best and largest quantity of work seem to avoid it.

Principle of the Solution

When copper is alloyed with zinc, the mixture will be red, bronze-color or yellow, depending upon the quantity of zinc it contains. The following table will serve to illustrate the different colors obtained with the various mixtures:



Variety of Bronze Plated Steel and Iron Goods as Now Manufactured.

95%	5%	Red
92%	8%	Red Bronze
90%	10%	Real Bronze
88%	12%	Light Bronze
85%	15%	Light Bronze
80%	20%	Green Brass
75%	25%	Green Brass
70%	30%	Yellow Brass
66%	34%	Yellow Brass

When the amount of zinc exceeds 40%, the metal again begins to take on a reddish shade.

It will be seen, therefore, from the preceding table that in order to obtain a real bronze color, the amount of zinc in the deposit should be about 10%.

While it is theoretically possible to make up a bronze solution by taking known weights of potassium cyanide, copper carbonate and zinc carbonate, it is a practical impossibility to do so on account of the always varying purity of the materials used. The method herein described avoids any weighing except that of the cyanide, and after a solution is once made, no additional weighing is needed to maintain it in good condition. It is believed that no simpler method can be found.

The principle is based upon the use of a cyanide copper solution in good working condition as the starting point and then to add to it, little by little, with trials for color by making a deposit on any suitable metal surface, zinc carbonate dissolved in a potassium cyanide solution. The zinc solution is made by dissolving *all* the zinc carbonate that a solution of potassium cyanide in water will take up so that *no free cyanide* is present. When this solution is added to the copper solution, both to make a new bronze solution, and to replenish an old bronze one, the amount of free cyanide in it is not disturbed. The use of such a method has been found very satisfactory.

To begin the making of the bronze solution, a good cyanide copper solution must first be produced and the following method is used:

Making the Preliminary Copper Solution

To make the copper solution used as the base of the bronze solution, two materials only are necessary:

1. Potassium cyanide. This should be of good commercial grade and there is nothing to be gained by the use of a cheap article. It should be in white lumps that dissolve readily.

2. Copper carbonate. The *plastic* carbonate is preferable, as a usual rule, to the dry carbonate as it dissolves more readily. When dry carbonate is used it should be fine and not full of lumps.

Take the following:

Potassium Cyanide.....1 lb. or 100 lbs.
Water .....1 gallon or 100 gallons

The cyanide can be dissolved in the water in the tank by allowing it to stand in the cold and frequently stirring, or by placing it in baskets and hanging in the top of the solution. In this manner it readily dissolves as the solution does not require stirring. Unless the operation is to be hurried, the use of a steam pipe in the solution will be unnecessary, but by warming the water the dissolving takes place more rapidly. Care should be taken to avoid too much heat as cyanide decomposes upon boiling. From 120 to 150 degrees F. will answer.

When the cyanide has all dissolved and the solution has been well stirred to mix it, allow it to cool down so that it is warm, but not hot. The object of this is to avoid the generation of too much heat when the copper carbonate is added. It is well known that when copper carbonate is introduced into a cyanide solution, heat is generated, and if the cyanide solution is quite hot at the beginning, so much heat is generated that the solution may actually boil and a black oxide of copper is formed which dissolves with much difficulty.

When the solution has cooled to a temperature of from 100 to 120 degrees F. in winter or at the ordinary temperature in summer, it is ready for the addition of the copper carbonate. *Do not weigh the copper carbonate, it is unnecessary.* Add it directly to the cyanide solution, little by little with stirring. At first the carbonate will dissolve rather slowly, but after a few minutes it will go into solution and then the rest will dissolve easily. Keep adding the copper carbonate until the solution will take up no more and it is slightly green from the undissolved amount left. At the end point, care should be taken to add as little of the copper carbonate as possible when no more will dissolve. The object is to dissolve in the cyanide solution all the copper carbonate it will take up and yet have practically none left. A slight excess, however, will do no harm.

There is now obtained a cyanide copper solution which contains *no* free cyanide, and if used for electrodeposition, the anodes would soon coat over with a slime and prevent the passage of the current. In order to overcome this, it is necessary to add some more potassium for *free cyanide.* Proceed as follows:

Free Cyanide Addition

The (Previous) Copper Solution
1 gallon or 100 gallons
Potassium Cyanide .....4 oz. or 25 lbs.

It has been found that about 4 oz. of free cyanide in each gallon of solution is necessary to keep the anodes clean. In case they do not keep clean, then it is a simple matter to add a little more as the occasion demands it.

The copper solution thus made up may be used for copper plating if desired. When carefully made according to the preceding directions *it will stand about 12 Beaumé,* and will also ,have a sherry color. A reddish flocculent precipitate usually floats about in the solution and consists of iron hydroxide present as an impurity in the copper carbonate. It does no harm and will finally settle to the bottom of the tank.

The Stock Solution of Zinc.

The quantity of the zinc solution actually needed for adding to the copper solution is only about one-ninth of it, but it is well to make up considerably more than this in order to preserve it for future use. From time to time it is necessary to add some of the zinc solution to the bronze solution, after it has been worked for a while and the stock zinc solution is employed for this purpose. It is well to make up a quantity of at least one-quarter that of the copper solution, and store in bottles or carboys for future use and which are kept closed from the air.

To make the stock solution of zinc, take the following:

Water .....1 quart or 25 gallons
Potassium Cyanide ...4 oz. or 25 lbs.

Dissolve the cyanide in the water and then add to it as much plastic zinc carbonate as it will take up and still have a slight quantity left undissolved. In this manner a solution of zinc carbonate in cyanide is obtained containing *no* free cyanide. The absence of any free cyanide in it allows it to be added to the bronze solution from time to time without danger of interfering with the amount of free cyanide in it. Plastic zinc carbonate is much better than the dry material as it dissolves more readily. Zinc carbonate does not dissolve as easily in cyanide as copper carbonate, and the dried material is apt to contain lumps which will not readily dissolve. Plastic carbonates (so-called) are those which have not been allowed to dry after precipitation and hence no hard granules are formed.

Making the Bronze Solution

The stock zinc solution is added to the copper solution in small quantities at a time and a trial made upon a piece of work after each addition. The color of the deposit indicates whether the right quantity of the zinc solution has been added. At first only a red color is obtained, then a red bronze, and after more has been introduced a true bronze color is produced. This is the desired point and the bronze solution is then ready for use. If too much zinc solution is added a yellow brass will be obtained. It may be of interest to know that a brass solution may be made in this manner equally as well as a bronze and all that is required is to add more of the stock zinc solution.

As an example of about the quantity of the stock zinc solution necessary to produce a bronze color, let the following be cited:

If a 100 gallon solution is used, a change from the copper will be noticed when about 5 gallons of the stock zinc solution have been introduced. When 10 gallons of the stock zinc solution have been added a true bronze color will be obtained on the work. When 20 gallons have been used, the color is too light and begins to approach a yellow brass. The best amount to use is about one-ninth or one-tenth of the copper solution, but no fixed rule can be laid down. The only safe and sure method is to try the solution after each addition and when the desired color has been obtained, stop.

Current and Temperature

For steel work, and this is the class of goods that is generally plated with bronze, a current of a tension of about 3 volts has been found satisfactory for the work. A weaker current gives a redder color and a stronger one a lighter one with danger of blistering. The best current strength is that when the evolution of gas from the work is not rapid, but slow.

While a bronze solution may be worked cold, it will be found that more satisfactory results will be obtained when it is used hot. In practice, it is difficult to maintain plating solutions at a temperature much over 150 degrees F. and it can be said, therefore, that when the bronze plating solution is used at a temperature of from 120 to 150 degrees F., it will be satisfactory. A hot solution deposits metal more rapidly than a cold one, gives a better color and is less apt to blister. For steel and cast-iron a hot solution is particularly advantageous and it is advocated to use one whenever possible.

Use of Sodium-Bisulphite

The bronze solution can be worked with or without the use of sodium bi-sulphite as desired. If the work is to be buffed, it is un-

necessary, but when a clean, bright deposit is desired it can be employed and is useful particularly in old solutions. When used, add 2 oz. to every gallon of the bronze solution. As it is an acid substance, it will neutralize some of the free cyanide and a little more cyanide must be added to make up. As a usual rule 1 lb. of cyanide must be added for every 5 lbs. of sodium bi-sulphite used. This point, however, can be left to the appearance of the anodes, and if they coat over, then add more cyanide.

The Anodes

Rolled or cast bronze anodes can be used, but when employed it should be specified that they must be free from tin. Excellent results can be obtained with copper anodes, as bronze anodes rarely feed the solution in the necessary manner so that some of the stock zinc solution must be added from time to time. When the copper anodes are used, it is necessary to feed the stock zinc solution a little more frequently, but copper anodes are acted upon more readily than bronze ones so that one condition about offsets another. The plater can suit himself about the kind of anodes, but be sure and use plenty of them. It should be remembered that too many cannot be used. When too small a number are employed, the solution becomes robbed of its copper and zinc more rapidly.

Replenishing the Solution

The "barometer" of a bronze solution is the color of the deposit. When it is too red, add more of the stock zinc solution. When the anodes coat over and the current is thus impeded, then add more cyanide. The appearance of yellow brass as a deposit on the work shows that too much zinc has been added and more copper must be introduced. By following these indications, the regulation and manipulation of the bronze solution becomes quite simple. When it becomes too strong by evaporation, add water to bring it back to the desired strength. The bronze solution when first made up will stand about 12 or 13 degrees Beaumé.

Summary of Steps in Making the Bronze Solution

As it may be of value to the operator to summarize the various steps in making up the bronze solution according to the preceding directions, the following will indicate them:

1. Dissolve 1 lb. of potassium cyanide in 1 gallon of water and allow to cool so that it is barely warm. The solution will stand about 7° Beaumé.

2. Add copper carbonate to the cyanide solution until no more will dissolve. Such a solution will stand about 12° Beaumé.

3. Add to the solution thus obtained, 4 oz. of potassium to every 1 gallon of it for giving the necessary "free cyanide." It will then stand about 13° Beaumé.

4. Dissolve 1 lb. of potassium cyanide in 1 gallon of water for making the "stock zinc solution." This will stand about 7° Beaumé.

5. Dissolve in this solution all the zinc carbonate it will take up so as to leave no free cyanide. Such a solution will stand about 11° Beaumé. It is called the "Stock Zinc Solution."

6. Add the "stock zinc solution" to the copper solution in small portions at a time until a trial indicates that the desired bronze color has been obtained. The bronze solution will be obtained when the proportions of copper and zinc solution are about 9 to 1.

7. Replenish the bronze solution, when necessary, by the addition of the "Stock Zinc Solution."

Overcoming Difficulties

In running the bronze solution, difficulties may be encountered. Their solution is as follows:

Deposit too red. Add more of the "stock zinc solution."

Deposit too light color or yellow. Add copper carbonate.

Anodes become coated over after running a short time so that the current will not pass. Add more potassium cyanide for "free cyanide."

Blisters on the bronze deposit. Current too strong or work not clean or too much free cyanide in the solution.

No deposit forms although work gases freely. Solution too weak or too much free cyanide in it.

Deposit is of several colors on one article. Too little free cyanide.

Deposit muddy. Add bi-sulphite of soda.

Deposit difficult to obtain or work does not cover well. Solution cold. Use it hot.

Deposit does not stand buffing, but cuts through. Solution too weak or electrodeposition not allowed to take place long enough.

Making Hardened Steel Dies by Etching.

The ordinary method of making a steel die for stamping metals is to sink it by hand in the soft steel die-block, and when the desired design has been produced, harden the block and then draw the temper. Not only does this method of making a die involve the employment of skilled labor, but considerable time is consumed in sinking it; and worst of all, it frequently happens that the die, after all the labor has been spent upon it, will crack in hardening. Its only value then is for scrap iron.

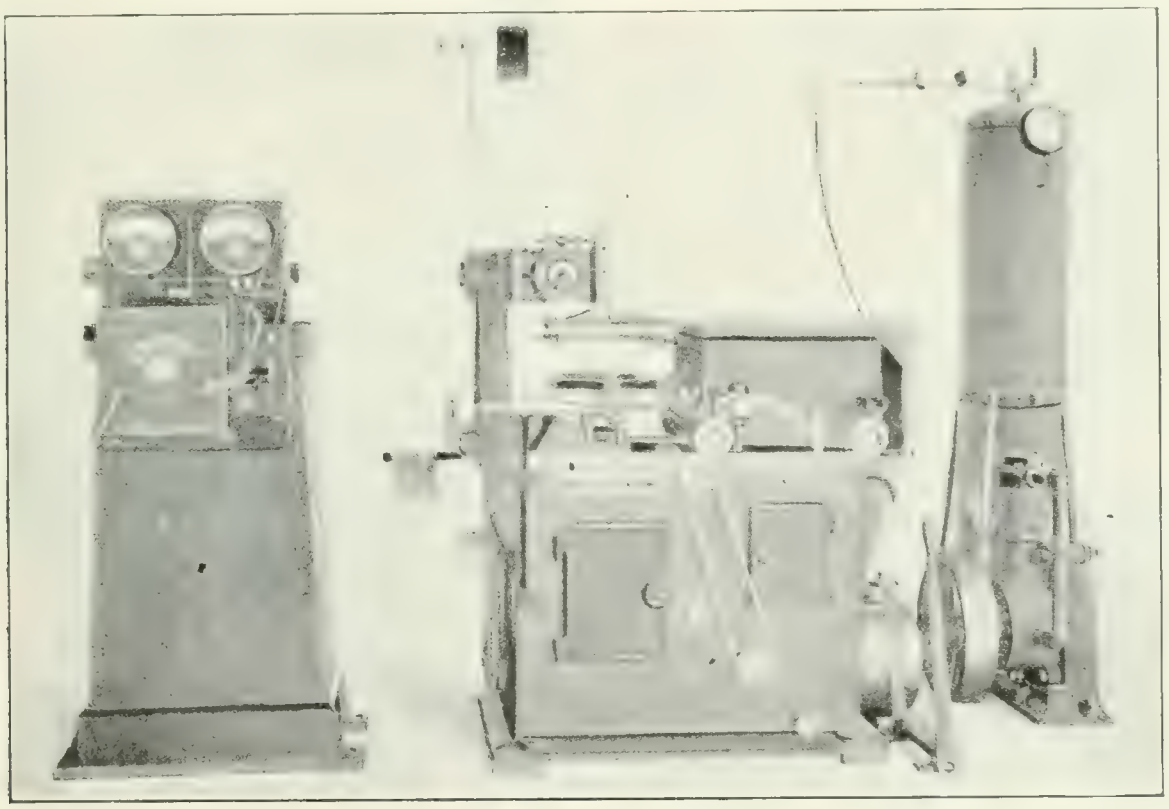


Fig. 1. Apparatus Used for Making Steel Dies by Etching.

A process for making steel dies by etching has been in use for some time, although it has not become extensively employed. The cost of the machine has been such as to prohibit its use except in establishments doing considerable work, but, it is believed, there are many shops in which it can be very profitably employed were its real value appreciated. It may be said, however, that a large number of concerns making dies are not cognizant of its existence.

The process of making steel dies by etching consists in making a hard steel die-block and then etching it by electrolytic action by bringing it in contact with a plaster of Paris reverse model of the die. The plaster of Paris is saturated with sal-ammoniac which renders it a conductor. By referring to Fig. 2, the principle of the process can be well understood. A plaster of Paris model of the die, reversed, is immersed in a solution of sal-ammoniac and connected with the electric current as the cathode. The steel block, of which the die is to be made, is placed upon it and connected as the anode. When the current is passed through the solution the action of the chlorine, set free at the anode (the steel block) etches it in whatever portions it touches so that the reversed impression of the plaster is reproduced in the steel. While the principle of the process is simple, it was found, when the process first became used, that a number of obstacles were in the way and it was only until these were overcome that the operation became successful.

The process was first brought out by Joseph Rieders of Germany who patented it in that country in 1897. At first, no apparatus of a special nature was used, but it was found that, owing to the carbon liberated from the steel during the etching that mechanical means must be used to remove it from time to time in order to allow the etching to go regularly. In order to do this, it became necessary to remove the steel die-block from the plaster and

difficulty was experienced in replacing it in exactly the same position. A special form of machine shown in Fig. 1 was, therefore, constructed so that the die could be removed and replaced in exactly the same position. The strength of the sal-ammoniac solution, as well as the current strength were found to be matters requiring adjustment, but after these details were worked out a successful machine was produced.

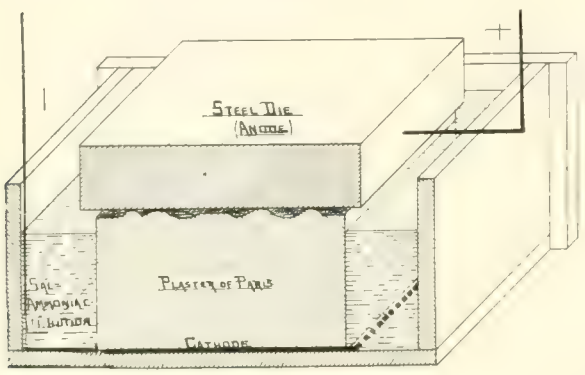


Fig. 2. Sketch Showing Principle of Etching Process.

In the machine now made, the carbon on the face of the die is cleaned by means of a roll brush shown in Fig. 2 and compressed air. In this manner the best possible contact between the plaster and steel is obtained. Accuracy is then insured. In Figs. 3 and 4 examples of a die and counter-die made by this process are shown, and which will serve to indicate the extension of the process.

Fig. 3. Steel Die Made by the Process.

The die, as it comes from the machine, is not completely finished as it is slightly rough, but a slight amount of finishing only is required. It may be said, however, that 90 per-cent of the work is performed on the machine. The other 10 per-cent is spent in cleaning up, sharpening the detail and polishing the die after it leaves the machine.

Fig. 4. Counter-Die Made by the Process.

The dynamo used for supplying the current, has a capacity of 30 amperes at from 1 to 15 volts, as may be required. It is usually considered that from 4 to 5 hours are required for the production of a depth of about 1/16 of an inch in the die-block.

The machine has been placed on the American market by the Electro Gravure Machine Co., for whom the F. Wesel Mfg. Co., of Brooklyn, N. Y., are the selling agents.

The name on steel knife blades is etched on the surface by means of the rubber stamp method. The surface is coated with gum-guaiacum-varnish, the rubber-stamp coated with a thin layer of potash solution, is then stamped on which removes the varnish leaving the steel free to be etched by dilute nitric acid. The rubber stamp method is the cheapest of any of the processes.

A New Method of Preventing the Pitting of Nickel or Copper Deposits.

A new and novel process for preventing the pitting of nickel or acid copper deposits, as well as preventing the formation of "warts" on their surfaces, has recently been discovered by Thomas A. Edison of Orange, N. J., the celebrated inventor. The process is novel in itself and coming as it does from a man of his ability, indicates that it is of value. Upon the process, a patent has been granted (U. S. Patent, 964,096, July 12, 1910).

The method of carrying out the process has been described by the inventor in such a concise and clear manner that it will suffice to describe it in his own words. They are as follows:

"In carrying on experimental and commercial operations in connection with electroplating, I find that the occlusion of hydrogen tends to make the deposit somewhat brittle and more or less porous, and that hydrogen gas clings to the surfaces of the deposited metal in the form of very fine bubbles, thereby making the surfaces more or less warty and rough. The presence of occluded hydrogen, as well as of the hydrogen bubbles referred to, prevents the deposition at a high rate, and also results in streaky and uneven deposits.

My object is to provide an improved process of electroplating, whereby I very largely eliminate the occlusion of hydrogen, as well as the formation of hydrogen bubbles on the deposited surfaces, and in consequence I am enabled to carry on a plating operation at a much higher rate than is now possible, and at the same time with the production of a better quality of deposit, less brittle in character, practically free of pores, and with a smooth and uniform surface.

The invention resides in the fact that by maintaining in the plating bath a small quantity of material which will combine with the hydrogen, for example, free chlorine, the latter will combine with any hydrogen set free by the electrolytic action, or otherwise, thereby preventing the formation of metallic hydrates as well as the occlusion of the gas, and eliminating also the appearance of microscopic bubbles thereof, which cling to the deposited surfaces. When free chlorine is thus present in the bath, it combines with any hydrogen generated to form hydrochloric acid, although it is possible that other favorable reactions may be brought about by the presence of free chlorine. The chlorine may be added to the plating bath in any suitable way, such, for example, as by passing the gas continuously, or at suitable intervals, through the bath; by adding to the bath, water saturated with chlorine, or by adding from time to time fresh quantities of the electrolyte saturated with chlorine. For instance, if copper is to be plated from a solution of sulphate of copper, the chlorine can be added by chlorinating a suitable quantity of the solution, which can be added from time to time in small amounts to the solution as the chlorine becomes exhausted. In practice, the solution should have a slightly acid reaction. I find that the effect of the chlorine thus introduced into the bath lasts for several hours, when a fresh quantity must be added. In the case of a chlorine bath (for instance, chloride of cobalt) a platinum or carbon anode of very small surface can be connected to the metallic anode and made to continuously chlorinate the solution, as will be understood. Practically all of the chlorine is utilized in combining with the hydrogen developed, there being very little loss of chlorine by its combination with either the anode or cathode. Free bromine may also be employed, but with results that are far inferior to those secured when chlorine is used. The use of chlorine cobalt plating baths is especially beneficial, and this is particularly true when cobalt-chloride solutions are employed."

Effect of Impurities on Zinc for Etching.

A writer in the *Inland Printer* commenting upon the effect of impurities upon the etching qualities of zinc, says that he has never etched any absolutely pure zinc and, therefore, cannot state whether it would etch better or worse than ordinary zinc. Novak found that zinc containing over 0.2% of cadmium was preferable when using an enamel, and that 1.6% of lead in zinc was not so detrimental to the etching qualities as has been asserted. The writer is of the opinion, however, that absolutely pure zinc cannot be etched as the impurities seem to be necessary to assist the action of the etching solution.

Making Aluminum Ingots from Chips or Borings.

One of the problems that is now confronting scrap metal smelters is the production of aluminum ingots from aluminum chips or borings. Large quantities of such material are now produced in the machining of aluminum castings, and a large proportion of them find their way into the scrap metal smelters hands who, in order to dispose of them is obliged to melt them and make ingots from them. Founders, too, who make aluminum castings for the trade are frequently required to take back the borings from their customers, and in order to use them with economy they must be melted and poured into ingots, which are then used up by adding a small quantity to melts of new metal.

As aluminum castings are machined in the regular way, and upon machine tools also used for machining other metals, aluminum chips are quite apt to be contaminated with chips of iron, brass or babbitt-metal. The removal of the iron should always be done before melting as it will cause the aluminum, when it becomes alloyed with it as it does in melting, to have a very coarse grain and become quite brittle. In case it does not wholly alloy with the aluminum, as frequently happens when the melting heat is low, the iron will remain in the ingot metal in the form of hard nodules which, when castings are made will injure any tools used for machining them. The removal of the iron is a simple matter, and all that is required is to run the chips through a good magnet machine, or to use a strong hand magnet. In this manner all the iron can be removed.

The removal of brass or babbitt chips is almost impossible except by hand which, of course, is too expensive to be considered. It is possible, (although, no one is known who does it) to use a concentrator for such a separation. When the aluminum chips contain a small quantity only of the brass or babbitt, it will not affect them seriously for ordinary work, but if a large amount is present, then it is not advisable to use them.

For melting aluminum chips, there is nothing better than a large crucible, say a No. 150 or No. 200. The waste is less when they are thus treated. If the chips are melted alone in the crucible, there is so much surface exposed to the air, that the oxidation is excessive and the loss is high. The method to use for melting the chips in order to reduce this loss to a minimum is as follows:

Fill the crucible about one-third or one-half full of heavy aluminum material, either in the form of ingots from previous casting or heavy scrap and allow to melt down gradually. Then allow to heat up until a good red heat is reached. Now add some of the chips and *immediately* stir in with a graphite stirrer. While an iron stirrer can be used, it is acted upon by the aluminum to some extent and the dissolved iron is sure to injure the metal. When the chips are stirred they will be immediately dissolved by the molten aluminum and as there is very little exposure to the air, a small amount of oxidation only takes place. More chips can now be added and stirred in and the operation repeated until the aluminum is too cold to take up any more. If desired, the metal may then be allowed to heat up again and the addition of the chips continued until the crucible is full.

After all the chips have been stirred into the molten aluminum that can be taken up, the dross should be skimmed off and then a few small pieces of chloride of zinc thrown on the surface of the metal to clear it. When they are thrown on, the aluminum must be stirred and it will be found that the surface will become quite clean. Now pour the aluminum into ingots and it will be found that the loss is as small as can be obtained.

Aluminum ingots that have been made from chips are never equal to new metal, even if free from contamination with iron, brass or babbitt, but they can be used for cheap classes of work and other kinds of castings which do not require strength. They are also useful for adding to yellow brass, in the usual small amounts, to render it free-flowing in the manufacture of saddlery hardware, automobile work and many other classes of yellow brass work in which it is now customary to use a little aluminum.

A nickel wire heated to a high temperature in hydrogen gas for some time seems to undergo a permanent change and the electrical resistance is increased. With platinum the melting point is lowered.

Lead is the principal impurity in commercial spelter and is difficult to keep out as it distills over with the zinc in making it from the ore.

Properties of Tungsten and Molybdenum Wire.

In the *Trans. Am. Electrochemical Society* C. G. Fink describes the properties of tungsten and molybdenum wire as made at the present time by the General Electric Co., of Schenectady, N. Y. The wire tested and results of which are herewith given, were made in the laboratory of that company.

Ductile tungsten is a bright, tough, steel-colored metal which can be drawn into wire less than 0.001 in. in diameter. The tensile strength increases as the drawing proceeds as the following table will indicate. Two sets of wire were tested:

Tensile Strength of Molybdenum Wire

Diam. in In.	No. 1	No. 2	
0.0050	460,000	490,000	lbs. per sq. in.
0.0028	480,000	530,000	lbs. per sq. in.
0.0015	550,000	600,000	lbs. per sq. in.
0.0012	580,000	610,000	lbs. per sq. in.

Under similar conditions hard-drawn steel piano wire of 0.003 in. in diameter had a tensile strength of 507,000 lbs. per sq. in.

The tensile strength of molybdenum wire was found to be less than that of tungsten. The following results were obtained:

Tensile Strength of Molybdenum Wire

Diam. in In.	No. 1	No. 2	
0.0050	200,000	260,000	lbs. per sq. in.
0.0028	230,000	270,000	lbs. per sq. in.
0.0015	270,000	310,000	lbs. per sq. in.

The specific gravities of tungsten and molybdenum were found to be as follows:

Sp. Gr. of Tungsten 18.81
Sp. Gr. Molybdenum 10.02

These specific gravities, however, increase with the amount of working as the metals are drawn into wire.

The electrical properties of the hard drawn wires were found to be as follows:

Tungsten Wire

Specific Resistance 6.2 microhms per c. c. at 25°C. (hard-drawn).
Specific Resistance 5.0 microhms per c. c. at 25°C. (annealed).
Temperature Coefficient 0.0051 from 0° to 170°C.

Molybdenum Wire

Specific Resistance 5.6 microhms per c. c. at 25°C. (hard-drawn).
Specific Resistance 4.8 microhms per c. c. at 25°C. (annealed).
Temperature Coefficient 0.0050 from 0° to 170°C.

The two metals behave in a similar manner toward chemical reagents. They are readily attacked by fused oxidizing salts such as sodium nitrate, potassium bisulphate or sodium peroxide. Hydrochloric, sulphuric and nitric acids attack tungsten very slowly, but molybdenum more rapidly. A fine tungsten wire, weighing 1.3638 grams heated for 14 hours in a mixture of chromic and sulphuric acids lost only 0.0003 of a gram.

Lead Safe for Preserving Radium.

Consul Halstead of Birmingham, England, has recently given the following account of a lead safe, for the preservation of radium, that has been made by an English firm of safe manufacturers:

"A remarkable safe, the first of its kind ever constructed, has been made by an English firm of safe makers for the British Radium Corporation. It has been specially constructed for the storage and protection of radium, and though only about 3 feet in height it weighs a ton and a half. Great ingenuity has been exercised upon the design and construction in order to make it, as far as possible, proof against the skill of the most expert burglars and against all risks of loss by emanation. Experiments proved that practically the only metal which would withstand the great penetrating power of radium emanations was lead, but as this was not at the same time burglar proof the only solution was to construct a safe with an interior of lead and an exterior of steel. The interior shell was made of 3-inch lead and the outer casement of a similar thickness of steel. Another difficulty was the fitting of the door to prevent the escape of any ray of light. This was secured by constructing a circular lathe-turned door which has a "dead" fit, and has a specially ingenious contrivance for immediately remedying any wear and tear caused by opening and shutting the door. Another safeguard which had to be taken was to prevent loss of emanations when the door is opened. To overcome this two valves have been fixed into the door through which tubes of mercury will be passed for the collection and storage of the emanations."

The Elastic Limit of Manganese-Bronze.*

By J. A. Capp.

To keep up with the demands upon the laboratory for more work in a given time, testing machines have been speeded up and the slow extensometer has largely been displaced by the dividers, used either unchanged or with some means of magnification. To represent castings and forgings the short test piece with one-half inch diameter and two-inch gage length is almost universal. As a consequence, while reports of tests usually include a statement of "elastic limit," the property of the material actually determined is in reality that more or less vague value called the yield point. It is the object of this paper to show that while the yield point for steel is so well marked in properly conducted tests, and bears a sufficiently definite relation to the true elastic limit to warrant the dependence placed upon it by the engineer, there is no equally well defined point found in testing bronzes, and the value commonly obtained from rapid commercial tests as the elastic limit or yield point on bronze may be quite misleading.

Manganese bronze was selected as the metal to be subjected to the series of tests here recorded because, of the modern alloys, it is one of the strongest and is readily obtainable in the market. This metal is used as a type and the results, so far as behavior under a tensile test is concerned, may be taken as typical of brasses and bronzes in general, at least so far as they have come under the observation of the author in some seventeen years of testing materials.

Specifications issued by the Navy Department for manganese bronze, March 30, 1909, required the following approximate composition:

Copper	52 per cent
Iron	1 per cent
Zinc	40 per cent
Tin	1 per cent
Manganese	Trace
Aluminum	0.5 per cent

The specification further required:

Ten. Str.	65,000 lb. per sq. in.
Elastic Limit	30,000 lb. per sq. in.
Elongation	15 per cent in 2 in.
Reduc. of area	25 per cent

They state "the elastic limit is to be the yield point, measured by the drop of the bar."

Manganese bronze castings in the form of cylindrical bars about 1½ in. in diameter by 24 in. long, were ordered from several foundries supplying this alloy; the orders were placed through the regular channels, bars of about this size being required in ordinary production. In this way it was hoped that commercial material would be obtained, such as might be expected in castings of more intricate shape. To indicate the effect of working upon the metal, there were also ordered two bars of the same dimension hot-rolled to size, and two bars hot-rolled and cold-drawn. The effect of the cold drawing was lost to a great extent by the necessary turning off of the surface in preparing the specimen for test. Much of the cold-drawn metal is used in this way, however, when screw threads are required to provide means of fastening the part in place in the structure. From the bars so obtained, specimens were turned which provided a test section 1 in. in diameter by 8 in. between gage marks, and which had, for the purpose of gripping, ends 1½ in. in diameter threaded to fit the nuts required by the testing machine.

The following comparative results were obtained. When the extensometer was used, the elastic limit was taken from the curve. The commercial test gives the yield point, which is accepted, commercially, as the elastic limit and is, as will be seen, altogether too high:

Elastic Limit of Cast Bars
Lbs. per sq. in.

Specimen	1	2	3	4
Extensometer	15,000	16,000	19,400	16,000
By Dividers	26,000	25,000	29,000	26,000

Elastic Limit of Hot Rolled Bars
Lbs. per sq. in.

Specimen	1	2
Extensometer	18,000	18,000
By Dividers	30,000	30,000

Elastic Limit of Cold Drawn Bars
Lbs. per sq. in.

Specimen	1
Extensometer	17,000
By Dividers	43,000

It will be appreciated from the preceding results that the ordinary method of determining the elastic limit of the bronzes by means

*Abstract of a paper read at the meeting of the American Society of Mechanical Engineers, June, 1910.

of dividers while the test piece is being pulled on the testing machine, is not satisfactory. The yield point in such a case is not the true elastic limit. It will be noticed from the figures that the true elastic limit of manganese-bronze is quite low and much less than generally supposed. (The Government specifications which call for an elastic limit on manganese-bronze of 30,000 lbs. per sq. in. are impossible to meet when the preceding results are considered, and they have been considered incorrect for some time.—*Editor.)*

An Improvement in the "Wohlwill" Process for Refining Gold.

The Wohlwill process of refining gold is now in use in the leading Mints of the world and also in a number of other institutions in which fine gold is produced. Strictly speaking, it consists in using the impure gold as the anode in a chloride of gold solution containing free hydochloric acid. The impurities are not deposited as they are either left as a slime or pass into the solution. By it, gold of the highest degree of purity may be obtained without the excessive cost of the old method of purification by precipitation with sulphate of iron or oxalic acid. The test of time has demonstrated that it is an excellent process for gold refining. It has been limited, heretofore, to the refining of gold containing less than 6 per cent. of silver, but in a recent improvement patented* by Heinrich Wohlwill of the Norddeutsche Affiineries of Hamburg, Germany, it has been found possible to treat gold containing a large amount of silver thus rendering it profitable to treat Dore' bars and similar mixed gold alloys. As the process is novel and interesting in that it makes use of the alternating electric current, a full description in the words of the inventor may be of value. In connection with his process he says:

In treating gold containing a relatively large percentage of silver as the anode in an electrolytic bath, consisting of a gold solution containing free hydrochloric acid or chlorides, according to the method described in the patents above referred to, it has been found in practice, that when the proportion of silver in the material to be refined, exceeds six per cent, it is necessary, at regular periods mechanically to remove the deposit of chloride of silver which forms upon the anode. If this removal of the chloride of silver is omitted, gaseous chlorine is evolved at the anode, and interferes with the operation of the process. It has been found that the greater the density of the current used, and the greater the percentage of silver in the anode, the sooner this condition obtains. For this reason, the process cannot be satisfactorily employed to purify many varieties of gold coming from the mines, except by the use of a current of considerably lower density than can be employed in the purification of varieties of gold containing a smaller proportion of silver. By reason of the necessity of employing such current of lower current density, in refining gold containing a considerable percentage of silver, the operation is prolonged, and the removal of the chloride of silver from the anode materially increases the cost of the process.

Now, I have found that it is possible to wholly prevent the development of chlorine at the surface of the anode, and consequently to refine gold containing a very large percentage of silver by electrolysis in materially less time and at considerably lower expense than has been possible by the method hereinbefore referred to, by using an *asymmetrical* alternating electric current instead of a direct current.

Asymmetrical currents are produced either by commuting a direct current at small and unequal intervals of time, as for example, alternately every 1/50 and 3/50 seconds, or such currents may be produced by the simultaneous use of a direct current and an alternating current connected in parallel. I prefer however, to produce the asymmetrical current in a still different way, to wit by connecting a source of direct current and a source of alternating current in series. This I commonly do by connecting a direct current dynamo and an alternating current dynamo in a series. It will be understood that in an asymmetrical alternating current, the curve of the current will be equal to the curve of an ordinary alternating current, but it will oscillate, not on the zero value, but on the value of the direct current as the zero line.

The quantitative effect of asymmetrical currents when applied to the refining of gold in accordance with the hereinbefore referred to

*Also patented in the United States. No. 961,924, June 21, 1910.

process, is practically the same as that of the direct current alone: that is to say the quantity of gold, dissolved from the anode, and precipitated at the cathode, is practically equal to the quantity calculated from the strength of the direct current alone, in accordance with Faraday's law. The advantageous effect of the alternating component of the asymmetrical current is however exhibited in various ways. For example, as soon as the alternating current is led into the direct current circuit, in which the electrolytic bath is included, the electric tension of the bath indicated on a direct current voltameter falls, and the greater the strength of the alternating current, the greater the fall in the electric tension of the bath. Both poles exhibit a change in their manner of action, the change being especially noteworthy in respect of the anode.

In the electrolytic treatment of gold in accordance with the old process hereinbefore referred to, the heating of the bath is absolutely essential, as the direct current when used alone, in the cold bath, even though below the requisite density of current,—500 amperes to the square meter,—produces a precipitation of the gold in the form of a powder which varies in color from dark brown to black. The use of an asymmetrical current not only renders it possible to increase the cathodic density of the current, in a warm solution, but also to refine the gold in a cold solution by the use of asymmetrical currents whose direct component has a density below 1000 amperes to the square meter, and obtain perfectly coherent precipitates.

In the practical operation of the process in its preferred embodiment, we proceed as follows: A direct current dynamo and an alternating current are connected in series in a circuit including the electrolytic bath and the direct current dynamo is excited until a polarized direct current ammeter inserted in the circuit, indicates the desired strength of the direct curent.

The strengths and voltage of the currents employed may vary widely according to the character of the gold to be refined. If the gold contains less than 10 per cent silver, the density of the direct current component can be advantageously increased, or, if preferred, the strength of the alternating component relative to the direct current component can be diminished.

It is found in practice, that the ratio of the strength of the alternating current to that of he direct current cannot be advantageously diminished below a certain limit. For instance, if the strength of the alternating current becomes less than .707. of that of the direct current, the combined current will not be an alternating current and will become a mere undulatory direct current of periodically varying strength, in which case, the peculiar advantages of the combined current hereinbefore set forth, are lost.

In the practice of my process, I ordinarily work with a gold chloride solution heated from 60 to 70° C., and containing at least 7 per cent. of free hydrochloric acid. In cases where too much importance is not attached to rapidity of treatment and one can therefore be satisfied with a density of the direct current between 500 and 1000 amperes to the square meter, the treatment can take place either at the temperature indicated, the bath containing hydrochloric acid in the proportion of from 1½ to 2 per cent. of the solution, or the treatment can take place with a cold solution in which case 7 per cent. of hydrochloric acid gas is employed. Instead of using hydrochloric acid in the gold chloride solution, I may substitute either wholly or partially therefore chloride such for example, as sodium chloride.

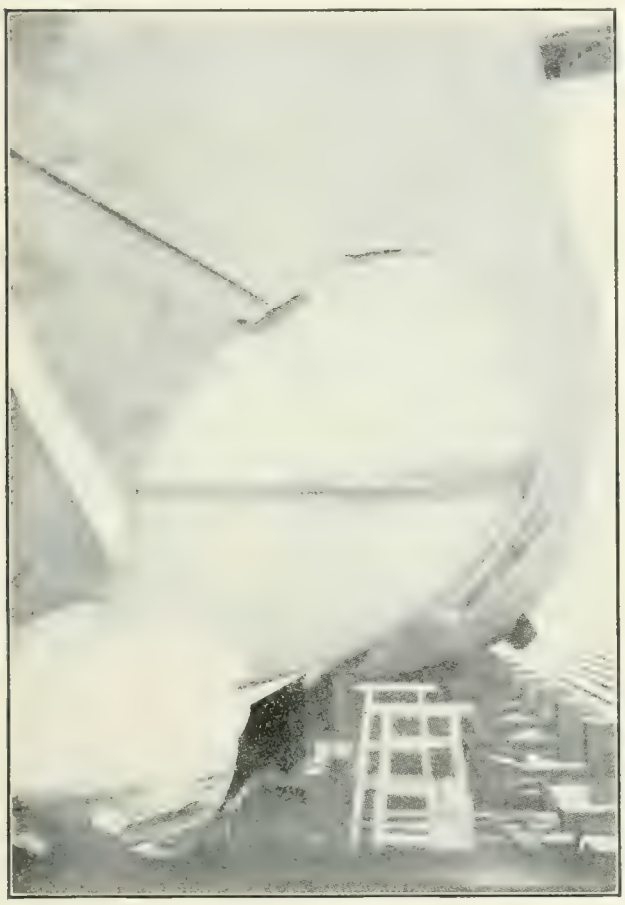
In the preferred practice of my process, I employ thinly rolled sheets of fine gold as cathodes and introduce gold into the electrolyte in the form of a gold chloride solution in proportion as the gold content of the bath is diminshed, in the operation of the process. In refining gold which contains a material percentage of lead, I may advantageously introduce sulphuric acid to the bath, preferably in a quantity approximately equivalent to that of the free hydrochloric acid present.

The presence of too much sulphuric acid in an acid copper solution causes the deposit to become granular and brittle.

According to a writer in a French periodical, iron or steel may be preserved for a long time in a weak solution of potassium bichromate without rust. Bright steel articles showed no signs of rust in nine months when immersed in such a solution, nor did they show any indications of it when boiled for 12 hours in the same solution.

Toughness of Manganese-Bronze Castings.

That the present extensive use of manganese-bronze castings where strength is needed is warranted, is indicated by the accompanying illustration for which we are indebted to the *Journal of the American Society of Naval Engineers.*. The U. S. S. *Michigan,* while undergoing standardization trials off Provincetown, Mass., struck some unseen object during a fog and injured the manganese-bronze propellers, the worst blade of the starboard one being shown herewith. After such an injury had occurred, it was found that 35% more power was required to maintain the desired speed than previous to the injury. The toughness of the bronze is indicated by the fact that the edges bent over as shown and the blades were not broken although the impact must have been considerable to produce the bending which took place.



Manganese-Bronze Propeller on the U. S. S. Michigan. Showing Toughness of the Metal.

Nickel Chain for Plating Barrel Connections.

One of the difficulties in the construction of plating barrels is the making of suitable connections with the articles to be plated so that the electric current may readily pass to them without interruption. While a simple matter in one way, it is difficult in another. Brass or copper connections are satisfactory in that they conduct the current without difficulty, but as they soon become coated with a heavy deposit of the metal that is being plated, it is necessary to replace them from time to time usually with a loss of the metal on them.

In plating with nickel in a plating barrel, (and the majority of plating in barrels is done with this metal) the use of brass or copper chains is followed with the usual heavy coating, and when so heavily coated as to become useless, they must be sold along with old baskets at a reduction in price from what the nickel itself is actually worth.

If the chains, which are frequently used for plating barrel connections, are made of nickel wire, when coated they may be used as anodes and the nickel on them reclaimed at its full value. Were this to be done with brass or copper chains, upon which the nickel had been deposited, there would be danger of contaminating the nickel solution with copper, but when nickel chains are used, they may be used without difficulty as an anode.

Pure nickel wire may now be obtained commercially and it is an easy matter to make a chain from it, even by hand, that will be suitable for barrel plating. Its cost, while higher than that of other common metals, will be found to be of no account when the reclaiming of the nickel on it is taken into consideration.

New Books.

SIMPLE JEWELRY. R. L. B. Rathbone. 94 illustrations. 294 pages. Cloth, 5¾ x8½ inches. Price $2.00. D. Van Nostrand Co., New York City. A practical handbook dealing with the elementary methods of the design and construction of jewelry. It is written for the use of designers, students and craftsmen. The book is well compiled and describes the complete manufacture of jewelry and its design.

Laboratory Experiments.*

Effect of Temperature in Producing the Ammonia Black on Brass.

In the use of the ammonia and carbonate of copper dip for producing a black color on yellow brass (frequently called the "black-brass dip"), it is necessary to employ it hot in order to obtain the best results. The exact temperature is not stated in text books.

Preliminary experiments were made with *cold* solutions in order to ascertain their effect. Three solutions were tried and yellow brass articles, previously bright dipped, were used for the trial:

1. Strongest ammonia water (sp. gr. 0.880) was used in which carbonate of copper was dissolved to saturation and then slightly in excess. The brass was stained a dirty brown at once and after allowing to remain for an hour only a brown stain could be produced.

2. Equal parts of the strongest ammonia water and water were used and carbonate of copper dissolved in it until a slight excess was present. After allowing to remain in this solution in the cold (temperature 70° F.) a fairly good black was obtained on the brass in about 15 minutes and after half an hour it did not change. In one hour the black was about the same. When rinsed and dried it was found to be fairly good but not dead black like that obtained in a hot solution. The color was not quite even and was inclined to be brownish.

3. Two parts of water and one part of strongest ammonia water were used and an excess of carbonate of copper dissolved in it. Even after an hour the brass was only stained with a brownish discoloration and no satisfactory black could be obtained.

It was apparent from the experiments that the cold solutions do not work satisfactorily, although the solution made of equal parts of ammonia and water was the best.

To test the effect of temperature, the solution containing equal parts of the strongest ammonia and water with an excess of carbonate of copper was used. This was heated to various temperatures and the effect on yellow brass tried.

At 100° F. the brass was only stained with a brownish discoloration in a few minutes. At 110° F. the stain was a little darker but yet the temperature was not sufficient to produce good results. At 120° F. fairly good results were obtained in a few minutes and this temperature seems to be the lowest that can be used to obtain a good black. The time required to obtain the black, however, was several minutes, while at a higher temperature the color was produced in a few seconds. At 140° to 150° the full black color was produced in a few minutes, and at 160° to 170° the best temperature was found as the color was obtained in a few seconds and with much uniformity.

It can be said, therefore, that a temperature of from 140° to 170° F. is necessary for the best results in oxidizing yellow brass with the ammonia and carbonate of copper solution.

*Made in the experimental laboratory of THE BRASS WORLD.

The Oldest Shot Tower in the World at Bristol, England.

The following information concerning the English development of the manufacture of shot is furnished by Consul Homer M. Byington, of Bristol:

"The erection of the Bristol tower for shot making is credited to William Watts, plumber, in 1769. It was "built" by sawing a square hole in the center of the various floors of his house, and locating the well in the cellar. This tower is still in use, although it has been heightened by the addition of some stories. Watts secured a patent on December 2, 1782, and sold his London rights in 1800 for £10,000 ($48,665).

The lead from which the shot is made is smelted by the present company, and poisoned by their secret process, at their establishment. When molten it is poured into a sieve-like receptacle at the top of the tower and these molten drops, falling into a well, 120 feet below, form the shot, which are then passed through a polishing grader. They are then spilled from a hopper onto an inclined plane; the perfect shot run onto a second plane, while the imperfect drop into the opening between. The shot pass over four series of planes and only the perfect reach the last plane, whence they are weighed into sacks and sewed up, by a Singer cord-sewing machine, ready for the market.

The tower being only 120 feet in height, a larger size than BBB cannot be manufactured by this process. The larger shot, including shrapnel for the British Government, are prepared in two different ways. For the medium size shot a wire of the proper material is fed into a machine which, simultaneously, mashes it into a ribbon shape and punches irregular formed shot. The largest shot are made by pouring the molten metal substance into long bullet molds, which, cooling, forms irregular shot. The various sizes are then placed each by themselves in gins which are revolved for six hours, when the shot come out perfectly smooth spheres.

The power for the plant is furnished by a gas engine, and the machinery is all British, with the exception of the cording machine mentioned."

Absorption of Gases by Metals.

The absorption of gases by metals when melted is responsible for many of the defects and imperfections in castings made from them. They are the cause of blowholes and pin holes. Considerable attention is now being paid to the study of this gas absorption. A. Sieverts and W. Krumbhaar in *Berichte,* 43, 1910, page 893 describe the results of their experiments on the subject. The volume of gas absorbed by a number of metals and alloys when heated to various temperatures was determined and under pressure. For temperatures up to 1100° C. a quartz flask was used, but when a higher temperature was needed a glazed porcelain tube was employed. The results are as follows:

It was found that nitrogen was not soluble in cadmium at 400° C. or in thallium, zinc, lead or bismuth at 600° C., or in tin and antimony at 800° C. or in silver and gold at 1300° C., or in copper, nickel and palladium at 1400° C. Aluminum absorbed nitrogen gas at about 800° C. while iron absorbed it at 1200° C. and did not expel it again in a vacuum indicating the probable formation of a nitride.

In the case of carbon monoxide gas, copper did not absorb it or react with it at 1520° C., but both solid and molten nickel absorbed it and failed to give it out again in a vacuum. Sheet cobalt evolved large quantities of gas at 1400° C. and this gas was not analyzed. Liquid silver dissolved oxygen, while gold did not.

Copper absorbed sulphur dioxide gas while molten and retained 80% when solidified all of which was evolved in a vacuum. Hydrogen gas was not absorbed by cadmium, thallium, zinc, lead, bismuth, tin antimony, silver or gold. Copper, nickel, iron and palladium absorbed hydrogen. On cooling, copper retained 20% and nickel 8% of the hydrogen gas absorbed, while in the case of iron the evolution of the gas in the vacuum was so violent that the tube containing it was blown to pieces.

In the experiments with alloys it was found that the presence of gold in silver lowered the solubility of oxygen in the silver.

Results of Investigations in Sherardizing.

J. W. Hinchley in the *Transactions of the Faraday Society* gives the results of some experiments and experiences with sherardizing. He says that for the successful coating of iron or steel articles by this process (heating in a closed receptacle with zinc dust,) the most important factor is the content of metallic zinc in the zinc dust used. The limits of time and temperature are comparatively wide. The best results are obtained with zinc dust containing 18% of metallic zinc.

The author considers that the view of Cowper-Coles that zinc is vaporized from the zinc dust and condensed on the iron or steel articles is not correct, for no deposit can be obtained from zinc vapor at temperatures below the melting point of zinc, such as are used in sherardizing. In this process, the deposition begins at a temperature just above that required to produce a film of magnetic oxide on the iron, and the deposit invariably contains iron.

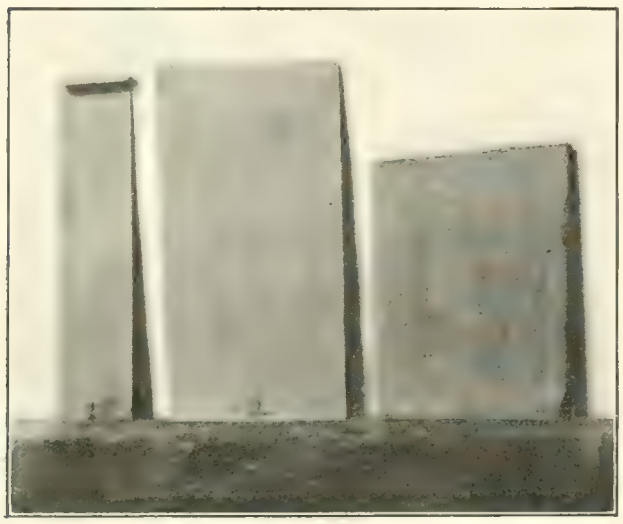
It is concluded that the coating is a closely adherent film of a solid solution of iron in zinc produced by the interaction of the metallic zinc in the zinc dust and the film of magnetic oxide of iron. If the proportion of metallic zinc present be low, a black film of reduced iron is formed. The zinc coating is very resistant to atmospheric corrosion after the slight yellowish powder which is first formed, has been washed off. Sherardized chain blocks have remained free from rust after use for seven years in the open air.

Correspondence.

Malleable Nickel.

Editor:

In the May issue of THE BRASS WORLD, I notice Question No. 800 on page 182 relative to pure sheet nickel. Referring to this matter, I will say that I produced, many years ago, pure sheet nickel containing only traces of impurities and which could be spun without difficulty. These sheets were electrodeposited and stripped from a greased metal cathode plate in the usual way.



Sheet Nickel and Nickel Plated Sheet Iron After Hot Rolling.

The writer is the inventor and owner of a process for electro-depositing nickel in any thickness and by which process several thousand tons of pure nickel were produced for the market. This metal has extraordinarily high physical qualities due to the total absence of carbon, sulphur or silicon which are contained in most metals produced by the fire process. The fact that nickel can be plated on other metals in adhering layers of any thickness makes this process fit for many uses besides making pure sheet nickel. If the party who asked the question is interested in this matter a shop right can be obtained. I have never taken out a patent, but the process remains a secret.

The samples shown in the illustration are:

1. A narrow strip of an electrolytic nickel deposit which demonstrates how pliable such pure nickel is.

2. This sheet was produced by plating some 3% of nickel on an iron billet and then rolling down, showing the great ductility and adherence of the plated nickel. This could be used as a substitute of tin plate. It will be noted that some rust spots have come through, but this is also the case with tin plate. The piece is about 10 years old and contains less nickel than the usual amount of tin on tin plate. It is certainly a remarkable specimen and shows what an excellent result would be obtained if a higher percentage of nickel were used or if the specimen is not rolled down as thin.

3. A piece of a nickel cathode split at the center at the greased side of the starting sheet. The cathode was, therefore, double the thickness and can be made any thickness desired.

William Thum.

Grasselli, Ind., July 11, 1910.

Asphaltum in Etching.

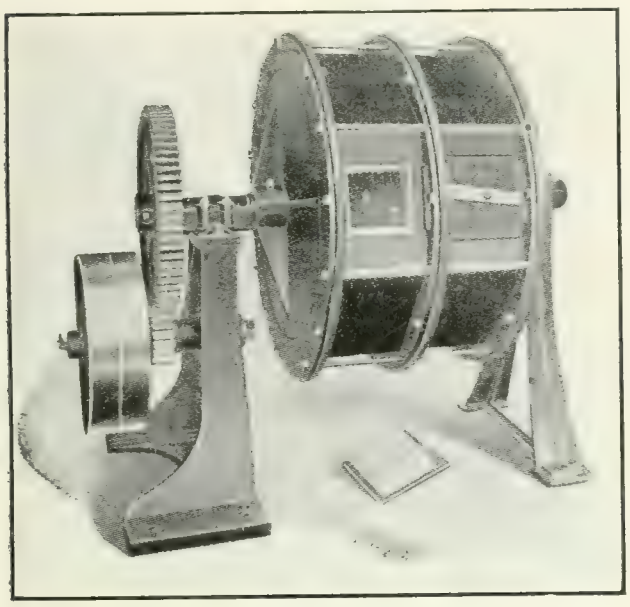
Asphaltum is an excellent resist in the etching of metals and when a metal plate is coated with a thin layer and exposed to sunlight for a time, those portions not acted upon by the light, (such as follows in printing through a negative) become soluble in turpentine, while those upon which the sun has acted are not soluble. In this manner it is possible to make a print directly upon metal and which then can be etched. Asphalt was the first material used in photography for making a negative or print.

The difficulty in printing on an asphalt coated metal plate in the sunlight is in the length of time consumed to render the asphalt insoluble. Several hours or more are necessary in ordinary cases and this is too long for commercial work. E. Valenta in *Photographic Correspondence* states that if asphaltum is heated on a water bath with from 6 to 8 percent of its weight of sulphur chloride, diluted with 4 or 5 volumes of carbon bi-sulphide, an evolution of hydrochloric will take place. The warming is continued until this evolution has ceased, and then a portion of the carbon bi-sulphide is distilled off and the residue diluted with benzol. The solution thus obtained is then ready for coating the metal plates used for the etching.

The asphalt thus produced, it is stated, is practically equal in sensitiveness to bichromated albumen. Plates coated with the latter material require only a few minutes exposure to the sunlight.

The New "Abbott" Tumbling Barrel for Polishing Goods with Steel Balls.

A new and novel form of tumbling barrel for polishing small metal goods by tumbling them with steel balls has recently been placed on the market by the Abbott Ball Co., 14 Hicks St., Hartford, Conn. The barrel is herewith shown.



The New "Abbott" Tumbling Barrel with Use with Steel Balls in Polishing Small Metal Goods.

The barrel is built with two compartments, as shown in the illustration, but is also furnished with one, two, three or four compartments as desired. Each compartment of this size barrel is 30 in. in diameter and 8 in. wide inside. Smaller sizes will also be made, viz: 18 x 5 inches and 7 x 24 inches. The small size will be found suitable for use in the manufacturing jewelry trade.

The barrel is made with the compartments narrow and of large diameter so that when the barrel is loaded with work and balls, there is considerable depth and a pressure is produced on the bottom of the load. A friction is thereby formed and a more rapid burnishing effect is obtained. A long sliding space is thus obtained so that the balls slide over and under the articles in the barrel and produce an effect identical with that of the ordinary burnishing tool. As the barrel is irregular in shape, the articles are constantly in motion while being tumbled and all portions of the surface come in contact with the steel balls.

One of the features of the barrel that has been obtained by the new construction is the absence of impact between the balls and articles so that there is no danger of denting. The long sliding contact, so necessary in producing good work with steel balls in a tumbling barrel, has been obtained. In order to arrive at this necessary condition, the inventor has carried on a long series of investigations so that the right construction could be produced.

A Stove Sand Dryer.

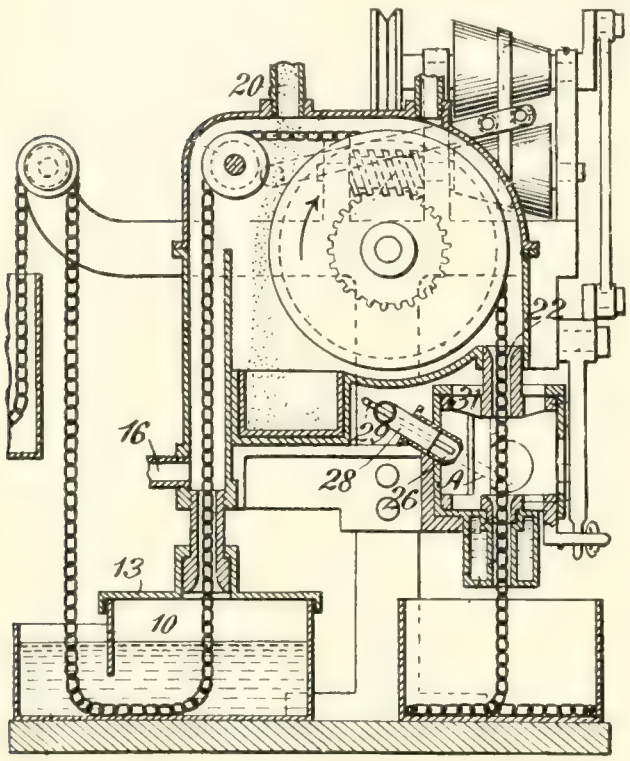
In many instances it is necessary to dry sand or other earthy materials either for use or shipment. For this purpose the "Stove Sand Dryer" made by the Henry Martin Brick Machine Co., of Lancaster, Pa., is very useful. The dryer is herewith illustrated and consists of a stove upon which is situated a heavy metal dome. The green or wet sand is placed around the dome inside the steel screen or jacket. The arrangement of the dome is such that the heat is circulated through the body the sand, removing all the moisture and drying out the vegetable matter.

Martin Stove Sand Dryer.

The dry sand falls out through the meshes of the screen and over the bevel edge of the bottom, thus providing room for additional sand and rendering the operation continuous. Any kind of fuel may be used, hard or soft coal, or wood. The dryer is provided with a vibrating grate so that the fire box may readily be cleaned. The capacity is from 10 to 15 tons of sand per day.

An Automatic Chain, Soldering Machine.

A new type of machine for the automatic soldering of chain links has been invented and patented by Geo. H. Benjamin of New York City (U. S. Patent 962,413, June 28, 1910). The machine is intended more particularly for the hard soldering of the chain links of watch or similar classes of jewelry goods.



Benjamin's Chain Soldering Machine.

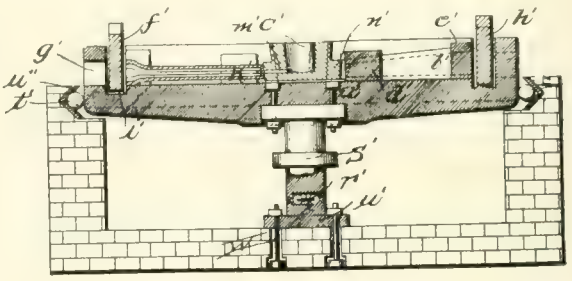
The chain is drawn, by means of a sheave-wheel, down through a bath of flux 10 contained in the receptacle 13. A non-oxidizing gas is passed through the pipe 16 so that the chain, during the soldering, is enveloped with it and oxidation is prevented.

Through the pipe 20 powdered magnesia is allowed to fall upon the chain as it passes along. This protects the portions of the chain that are not soldered from the flowing action of the solder so that the joint only is filled. It should be noted that the chain is made of gold or platers' metal with a core of solder so that each joint to be soldered has solder upon it.

The chain, as it passes along is heated by the blowpipe 28 that is directed against the link joint. After the link has been soldered the chain is passed through a water jacketed opening to cool it and is then delivered in a finished condition.

New Form of Centrifugal Casting Machine.

A new form of centrifugal casting machine has been patented by William B. Bary of St. Petersburg, Russia. The apparatus is constructed in the form of a wheel which is made to revolve horizontally. The metal is poured into the gate situated at the hub and



Centrifugal Casting Machine.

to which the molds are attached so that when revolved at a high speed, the metal will flow into them by centrifugal action and under the pressure produced by such action. The periphery of the wheel rests upon ball bearings so as to produce the necessary even motion while revolving.

New Alloy for Resistance Wire.

A new alloy for resistance wire has been patented by John T. H. Dempster of the General Electric Co., of Schnectady, N. Y. It consists of the following:

Iron	75%
Nickel	20%
Chromium	3%
Manganese	2%

These proportions may be somewhat varied to suit different cases. It is stated that the resistance of the wire to the electric current is twice that of German-silver with a much less cost, and at the same time has a high melting point. The wire can be used for resistance work with less danger of melting than when German-silver or other comparatively low melting metals or alloys are used. It is stated that the above mixture can be rolled into sheet or drawn into wire as readily as iron.

The "Nonesuch" Electroplating Machine.

The "Nonesuch" electroplating machine herewith illustrated is the invention of S. C. Catlin of Bloomfield, N. J., a plater of many years experience in the electroplating of small metal goods. It is the result of such experience and was patented in 1908. Other patents are now pending.

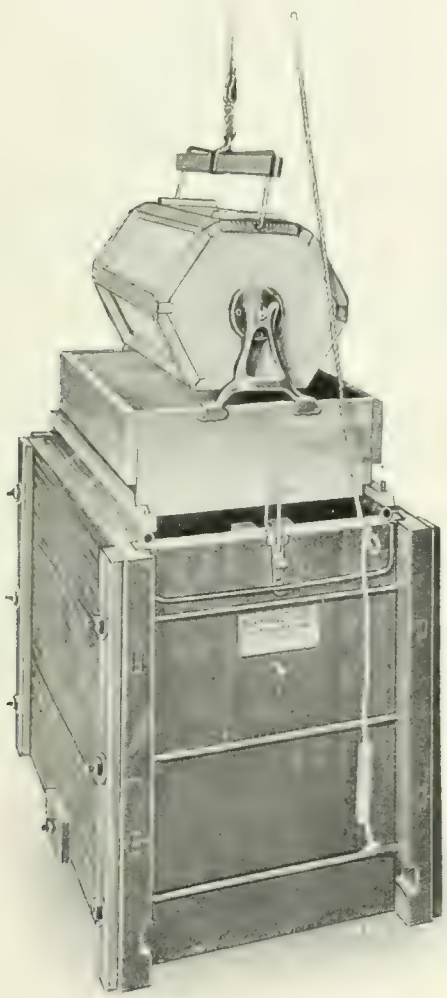


Fig. 1. Single "Nonesuch" Plating Machine.

The machine is made in two types: The single machine, shown in Fig. 1, and the double machine, illustrated in Fig. 2. Both machines are identical in operation although the capacity of one is double that of the other. The work to be plated is placed in a hexagon receptacle which revolves in the plating solution contained in the tank. The anodes are arranged on the sides of the tank as shown in Fig. 2.

The sides of the receptacle, in which the work to be plated is placed, are made of patent corded canvas which renders it light and durable and forms a soft, flexible surface against which the goods can strike without danger of abrasion. The employment of the canvas renders it posible to plate any class of material, no matter how small. When necessary, the canvas panels may be renewed at a small cost.

To empty the cylinder containing the plated goods, it is raised by a simple block and fall, and a tray placed under it. The panel is then opened and plated goods fall into the tray. The bottom of the tray is made so that the solution will pass through it and back into the tank, while the plated goods can then be rinsed and dried.

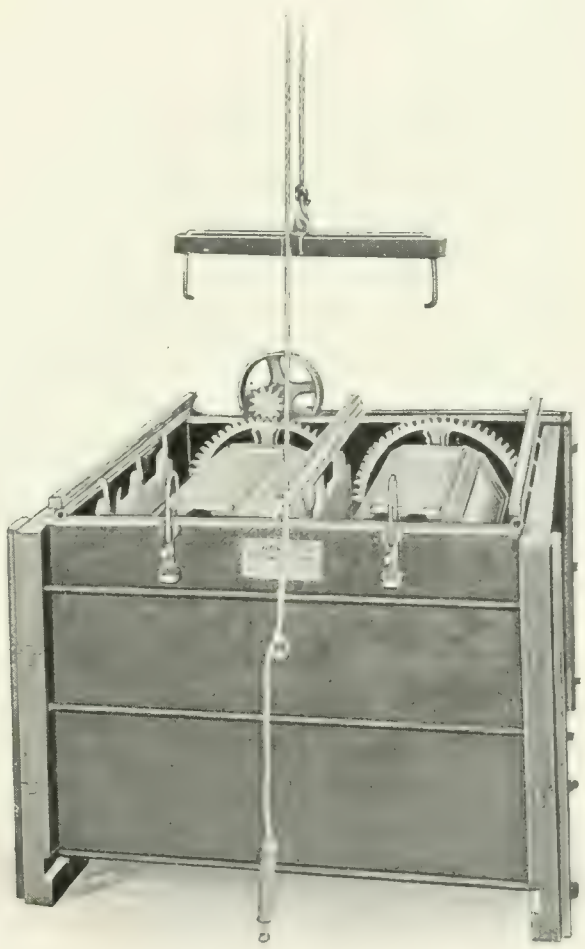


Fig. 2. Double "Nonesuch" Plating Machine.

Some of the important features of the machine are as follows: Any kind of articles, small or large may be plated in it. Convenience in filling and emptying the cylinder. Ability to examine goods while being plated. Simple cathode connections. No shaft running through the tank to cause leakage and no shaft through the cylinder to interfere with the tumbling of the goods in it.

The machine is manufactured by S. C. Catlin of Bloomfield, N. J., and for whom Rockhill & Vietor, 114 John St., New York City and 119 Franklin St., Chicago, Ill., are the selling agents.

The "Foster" Fixed Focus Pyrometer.

There are instances in which a pyrometer of the ordinary type cannot be used or in which it is inconvenient. This is particularly true in temporary work or experiments in which it is impossible to install fixed apparatus. In these cases the "Foster" Fixed Focus Pyrometer

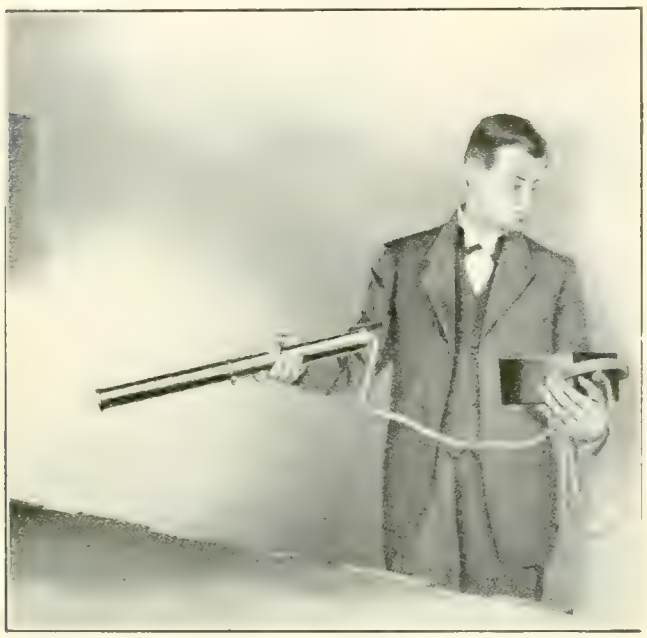


Fig. 1. Method of Using the Pyrometer.

made by the Taylor Instrument Co., of Rochester, N. Y., will be found quite satisfactory. This pyrometer has recently been placed on the market by them and is extremely simple in its operation.

The apparatus is shown in Fig. 1 and consists of two parts only: The pyrometer itself shown by the long tube, and the galvanometer used for the indicator. The method of using the instrument is shown in Fig. 2. It is simply held in the hand or on a tripod and pointed towards the body that is hot and of which the temperature is desired. The only requirement is that the distance of the instrument from the hot body or furnace opening must not be more than ten times the diameter of this hot body or opening. No specified distance is required other than the pyrometer shall not be too far away. It gives accurate results when closer than ten times the diameter.

The pyrometer is based upon the use of a thermo-couple upon which the heat is radiated and an electric current is produced proportionate to the heat. This current is registered in the galvanometer, but the scale is so graduated that the degrees Fahrenheit are read from it directly without calculation.

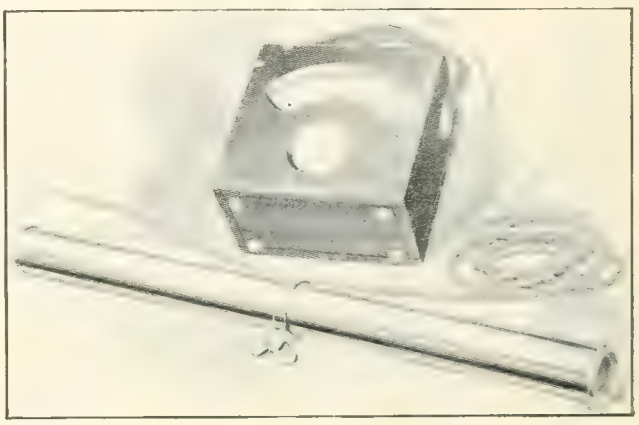


Fig. 2. The Complete Apparatus.

The pyrometer may be used at a moment's notice and requires no experience in working it. It has a range from 1000° F. to 2400° F. The indicator scale is boldly divided so that it may be read in a weak light. A tripod is supplied with the instrument if desired so that it may be fixed in one position for any length of time, but for ordinary work it is held in the hand.

Small quantities of copper are always present in commercial nickel anodes but do not appear to affect the character of the nickel deposit.

The pitting of nickel deposits is usually caused by the absence of a sufficient amount of nickel in the solution and frequently can be overcome by the addition of single nickel salts.

Soft metal castings that are to be plated should first be given a copper deposit in a hot cyanide copper solution as it gives a base for subsequent deposits. The hot solution is far better than a cold one as it gives a rapid and heavy deposit which adheres better than one produced from a cold cyanide copper solution. It is also less apt to blister.

The New "Acme" Oblique Plating Barrel.

Oblique electroplating barrels possess special advantages, and from the beginning of this important class of appliances they have always been attractive. In the first place, the work that is being plated may be inspected whenever desired, or carefully watched so that the

Fig. 1. The Front View of the "Acme" Plating Barrel.

character of the deposit is always apparent. The amount of plating solution required is not large and work may be plated in the smallest possible quantity. When completed, the finished articles may be removed by tilting the barrel. Small articles, such as pins, eyelets, hooks and eyes, etc., that are too small to be plated in the horizontal barrel are readily plated in the oblique barrel.

The Klauder-Weldon Dyeing Machine Co., of Amsterdam, N. Y., are now placing on the market the new "Acme Oblique Plating Barrel" that is herewith illustrated. This barrel was patented in 1905 and has been in constant use in many establishments since that time with excellent results. A number of improvements have recently been made so that the present barrel is now the result of some five years of experience.

As now made the Acme barrel consists of an ordinary oblique tumbling barrel made of wood of a kind that has been found best adapted for the work. By means of a worm-gear operated by a crank, the barrel is easily lowered or raised. A counterweight is fastened to the stem of the barrel and serves to balance it.

The anode and cathode connections are both made through the terminals shown in the illustration. These are fastened to a wood piece which is used simply to hold them in position. The electrical conductors supplying the current are connected directly with the terminals. One of the rods, used for the anode, passes down into the barrel and is

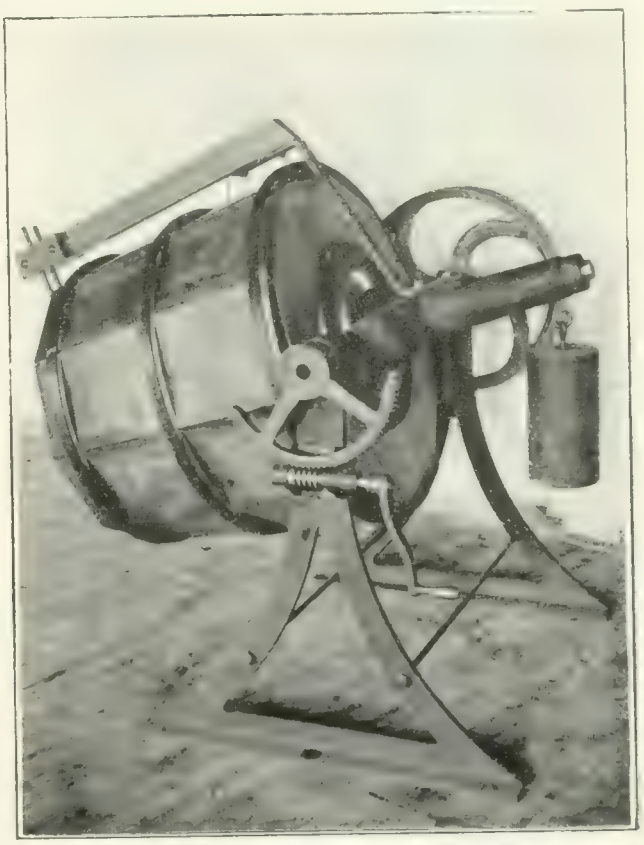


Fig. 2. Rear View of the "Acme" Plating Barrel.

connected with the anode held directly over the work, while the other is used for connecting the work being plated. It terminates in a chain which comes directly in contact with the articles being plated.

The barrel will be found a very satisfactory appliance for plating all classes of small metal goods and is now in use in a number of establishments with excellent results. It will readily be appreciated that it can be used for plating small as well as large quantities of work, and may be used in place of baskets for small goods.

New Forms of Brush Wheels for Platers and Brass Founders.

As ordinarily made, circular brush wheels consist of a heavy wood spindle with the tufts of wire, bristles, tampico or other material drawn in singly, or a still heavier metal spindle with the tufts inserted in it. The objection to this form of brush is that the tufts are not sufficiently close, and as the brush wears down, the space between them becomes even greater.

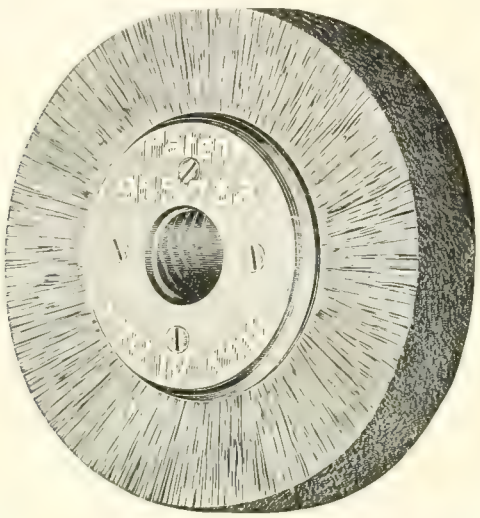


Fig. 1. Brush Made of the Sectional Rings.

A new form of brush wheel has recently been placed on the market by the American Wire Brush Co., 277 Greenwich St., New York City which obviates the foregoing objections. The brush is made in sectional rings as shown in Fig. 1 which are then placed over a spindle so as to produce the brush illustrated in Fig. 2. A cross section of the brush is shown in Fig. 3. If a long brush is desired, a large number of rings may be placed on the spindle so as to produce the brush shown in Fig. 4.

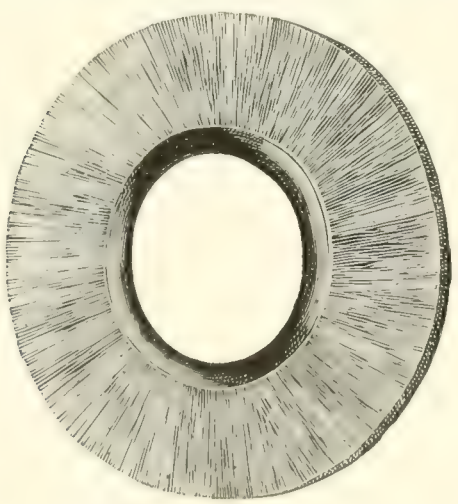


Fig. 2. Sectional Ring.

To produce a hard brush, the rings are placed close to one another on the spindle. Soft brushes are produced by placing cardboard or leather washers between the rings as shown in Fig. 3. A customer, therefore, may carry a stock of the rings and make any style or size of brush he may desire. Repairs, too are quickly made. The material of which the brush is made is in the shape of a hairpin and firmly cemented so that it cannot pull out.

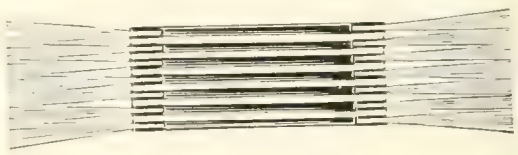


Fig. 3. Cross-Section of a Ring.

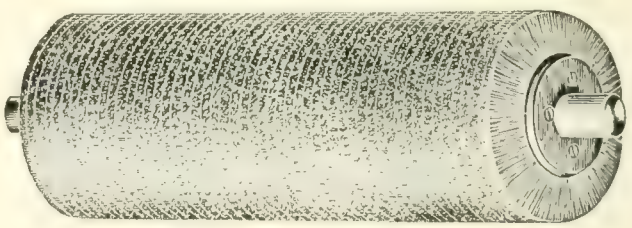


Fig. 4. Long Brush Made of the Rings.

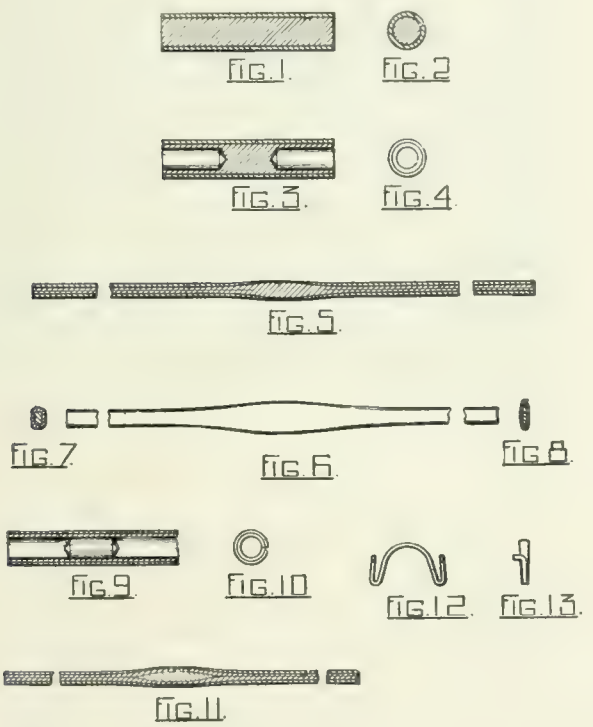
The rings are made in all sizes and diameters and of any kind of material that may be desired for special purposes. Wire, bristle, fibre, horse-hair, yarn, felt, and cloth are some of the substances supplied. The wire is furnished in German-silver, brass, steel, bronze or any other metal that may be desired.

Improved Method of Making Seamless Plated Tapers for Spectacle Frames.

A new process of making seamless gold plated tapers for the production of spectacle frames has been invented by Rudolph G. Schutz of Providence, R. I., (U. S. Patent 962,985, June 28, 1910).

The invention relates to seamless plated tapers for use in the manufacture of jewelry, and is especially adapted for use in the manufacture of seamless plated spectacle-bridge tapers and seamless plated ring tapers. Heretofore in the manufacture of such tapers a piece of solid round seamless plated wire has been used, and the end portions reduced by

hammering the same in a swaging machine. When manufactured in this manner the precious metal upon the outside of the end portions of the taper becomes greatly reduced in thickness and considerably thinner than upon the central portion, by reason of the fact that said metal is hammered upon a solid core and can only spread lengthwise or longitudinally. This is very objectionable, as it leaves the very portion of the finished spectacle-bridge, as well as the ring, which receives the greatest amount of wear, with the least amount of gold and weaker at the very point where the greatest strength is desired.



Method of Making a Spectacle Bridge Taper.

Referring to the drawings, the method of making the improved taper is as follows: A short piece of plated wire composed of a solid base metal core and a seamless shell of precious metal 2 united to said core, as shown in Figs. 1 and 2, is drilled longitudinally at both ends forming the hollow end portions 3 and the solid central portion 4, as shown in Fig. 3. The blank thus formed is then hammered down by a swaging machine until the hollow end portions 3 become practically solid. While said blank is undergoing this operation the precious metal covering the central or solid portion 4 of the blank becomes a trifle thinner than it was originally, by reason of the fact that this portion of said blank is solid and when reduced in diameter, the precious metal can only spread or flow longitudinally or lengthwise of the blank. The effect of the hammering by the swaging machine upon the end portions 3 of the blank, however, is different and results in the precious metal covering these portions of said blank becoming thicker than it was originally, by reason of the fact that these portions of the blank are hollow, and when reduced in diameter by hammering, the precious metal will spread or flow transversely, as well as longitudinally, and therefore become thicker. The hammering operation will also produce the same effect upon the base metal core of the blank, the central or solid portion of which will become thinner, while the end or hollow portions will become thicker and the blank will assume the form shown in Fig. 5 when it leaves the swaging machine. When the taper thus formed is to be used for a spectacle-bridge taper, said taper is then flattened by dies to the form shown in Figs. 6, 7 and 8, and is then bent up into its finished form as shown in Figs. 12 and 13.

A Simple Method of Making Chromium-Bronze.

A simple method of making chromium-bronze has recently been discovered and patented by Walter Rübel of Berlin, Germany, (U. S. Patent 964,122, July 12, 1910). The method used for producing this alloy is as follows:

Chromium chloride is heated with metallic zinc and the chromium is reduced to metal which alloys with the zinc while zinc chloride is obtained at the same time. It is stated that when the zinc is alloyed with 2% of aluminum the reaction takes place more rapidly. To make the bronze mixture the alloy of zinc and chromium produced is added to copper.

To produce 100 lbs. of chromium-bronze, 3.2 lbs. of chromium chloride are heated with 40 lbs. of zinc. The alloy of zinc and chromium thus obtained is added to 57 lbs. of copper. This quantity will give a bronze containing about 1.25% of chromium in the alloy. The inventor states that to produce a bronze containing a desired amount of chromium, it is necessary to take two and one-half times as much chromium chloride as the quantity of chromium desired.

According to the inventor, a chromium bronze made by this process and containing:

Copper	58%
Zinc	41%
Chromium	1%

has the following properties:

Ten. Str. ..... 82,000 lbs. per sq. in.
Elastic Limit.. 41,000 lbs. per sq. in.
Elongation .... 18-20 per cent

A manganese-bronze may be made by the same method except that manganese chloride is used instead of chromium chloride. To introduce 1% of manganese in the bronze, it is necessary to use 3.2 lbs. of manganese chloride when 100 lbs. of bronze are to be made.

The inventor makes the following comments on the chromium bronze: "The chromium alloys exhibit great resistance to chemical reagents, because the chromium is reduced from a chloride and is alloyed *in statu nascendi* with the zinc."

A New Substance for Filling Holes in Aluminum Castings.

A new substance for filling holes in aluminum castings has recently been placed on the market by the Rheinhold NoFlux Aluminum Solder Co., 610 Union Building, Newark, N. J. It is used for filling holes and flaws in aluminum castings so that they may readily be stopped up and repaired. There are many aluminum castings made which have slight flaw holes in them, either from a "drop" in the

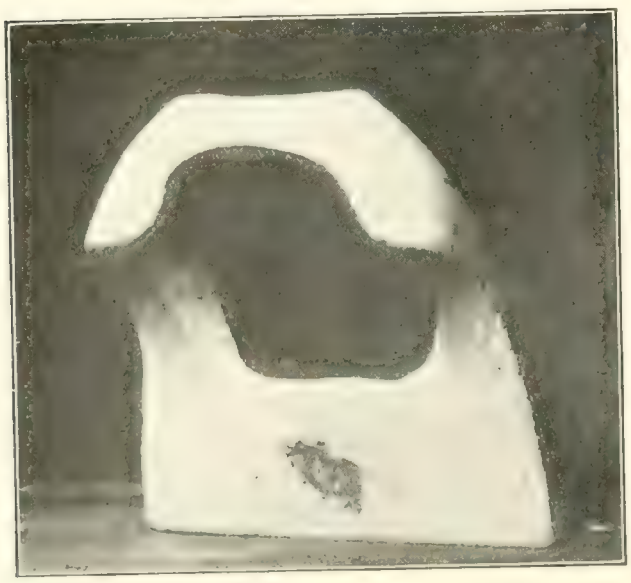


Fig. 1. Aluminum Casting with Flaw-Hole.

mold or slag or sand washing in. Such flaws do not injure the castings in any way except in appearance and by filling the holes the difficulty may be overcome.

The substance is called the "Willard Filler" and is used as follows: No flux at all is used. The casting is heated uniformly about the hole with a gasoline torch and the filler, which comes in small sticks, melts and flows freely into the cavity. Keep the casting well heated during the entire process and until the aluminum has taken up sufficient filler to make a good job. While the filler is melted in the

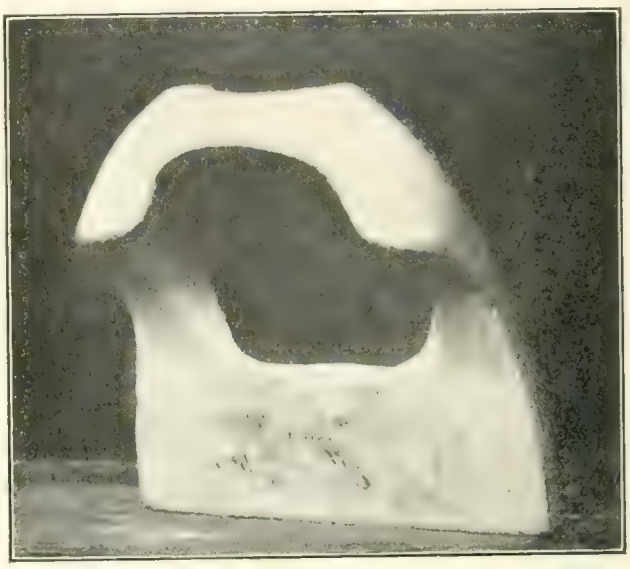


Fig. 2. Hole Plugged Up with the Filler.

hole, take a steel wire or scraper and scrape it well so as to work it in and then fill up the hole with the filler. It is more or less plastic when partially melted and the excess can be scraped off. A level or even surface is then produced. The filler is not to be used as a solder. A putty knife is useful in scraping off the excess while the filler is plastic. As no flux is used, there is no discoloration around the hole.

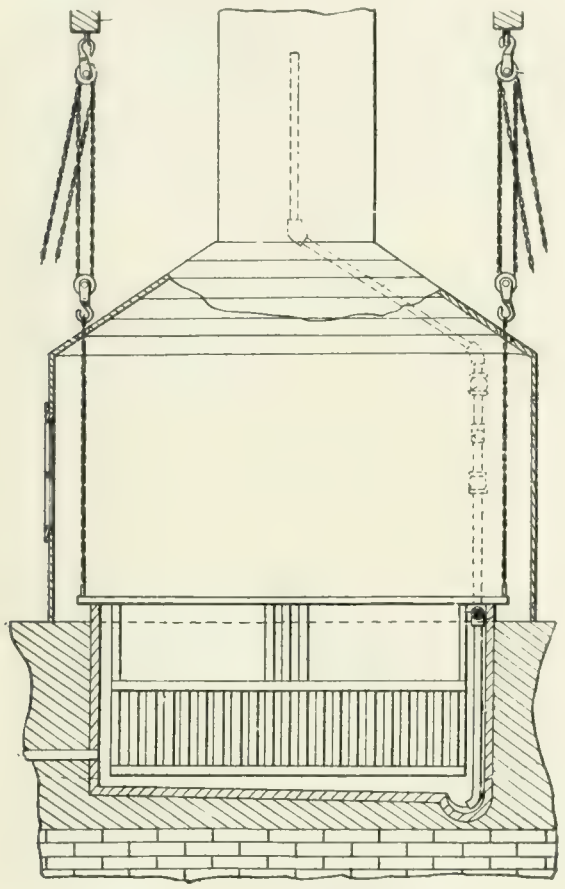
Apparatus for Pickling.

An apparatus for use in pickling metals has been patented by A. W. Obermann of Johnstown, Pa. (U. S. Patent, June 21, 1910) and is herewith illustrated. The object of the apparatus is to remove the obnoxious gases or fumes that arise when metal, particularly iron or steel, is pickled.

The inventor uses a concrete tank which, he states is permanent and is not open to the objections found in wood tanks as regards leakage. A hood is provided for covering the tank and the articles to be pickled are placed in a cage which may be raised and lowered by power thus avoiding the fumes. The hood is provided with a window to watch the opera-

tion and with doors for examination of the articles that are being pickled.

One of the useful features of the invention lies in the use of a steam-pipe in the top of



Apparatus for Use in Pickling.

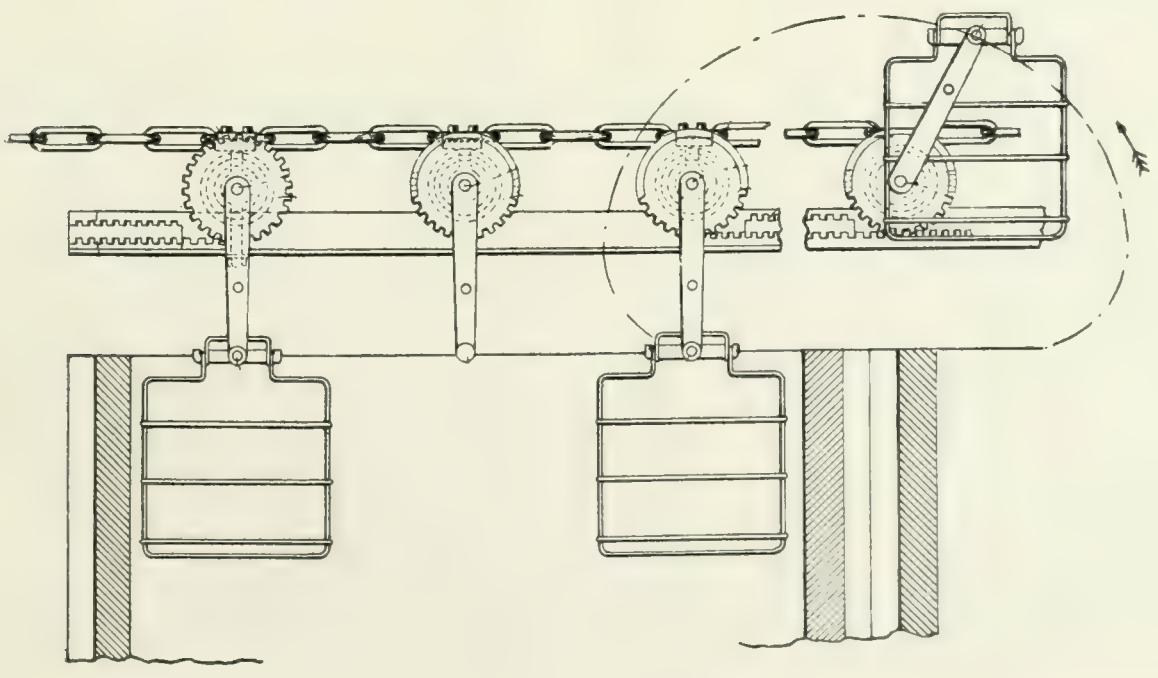
the hood for creating a draft and carrying off the fumes. A steam jet is allowed to pass through the pipe in a manner similar to a sand-blast nozzle so that the gases are mechanically sucked away.

Improved Dipping Mechanism for Plating Tanks.

An improvement in the dipping mechanism of the type of plating apparatus in which the racks of work are automatically lifted from one tank to another and carried along, has been made by John H. Shaw of New Haven, Conn., superintendent of the plant of Sargent & Co., of that city, hardware manufacturers. The mechanism is used on a machine of the well known "Broderick" type of which several machines are now in use in the plants of hardware manufacturers.

The improvement (U. S. Patent 963,817, July 12, 1910) is upon the arrangement used for lifting and carrying along the racks upon which the work being plated is held. The racks are hung from trolley wheels upon the periphery of which teeth are cut. A chain to which the trolley wheels are attached moves along and carries the trolley and rack from tank to tank. The work to be plated is attached to the rack in the usual manner, and the apparatus started. As the trolley moves along it comes in contact with a ratchet which acts as a trip and turns the arm containing the rack upwards so that it is lifted over the edge of the tank. Then, as it passes along and is released from the ratchet, the rack is automatically lowered into the next tank.

The process of plating is as follows: The rack filled with work passes to a cleaning tank containing alkali, then to a rinse tank, then to the plating solution, then to a rinse tank, then to a hot water tank, when it is dried and lacquered.



Questions and Answers.

QUESTION No. 839. We understand that steel-molds are used for casting soft metals, such as coffin hardware, soft metal novelties, etc. How are these made and what is the advantage over bronze molds?

Answer. Steel-molds are used to some extent for casting coffin hardware. They have the advantage that the surface of the mold can be made very smooth and highly polished so that the castings themselves will come out polished and need no finishing. They can be plated immediately after cutting off the gates. The molds are made like a steel die, that is by cutting the design out of a block of steel. They are quite expensive and unless a large number of castings are to be made, they will not pay. If the castings are to be finished the bronze molds answer well. The steel molds are used only for goods that will warrant the expense and which are to be made in very large quantities.

QUESTION No. 840 Can you advise us what can be used to clean up aluminum that has been overheated in melting. We have quite a little aluminum that has not been handled right and it is impossible to make clean castings from it.

Answer. While aluminum that has been overheated or "burnt" in melting cannot be brought back to its original condition theoretically, on account of the absorption of gases while in the fire, it can be restored quite satisfactorily by means of chloride of zinc. Melt the aluminum and then add small pieces of chloride of zinc with stirring. When the surface is clear and clean, enough has been used. Then skim and pour into castings.

QUESTION No. 841. I have a copper solution made up of cyanide and carbonate of copper. The anodes become covered with a white coating which will not scrub off. I added more cyanide and they turned black. What is the cause and the remedy?

Answer. The reason for the coating of the anodes is that you have too little free cyanide in the solution. The only object of free cyanide in a copper solution is to keep the anodes clean, and if your anodes do not keep clean it indicates that you need more free cyanide. When the word "clean" is used, it means that the surface of the anode is free from white or green slime although it may not necessarily be bright. Copper anodes, even when working best, are usually dark colored or black, but this does not mean that they are not working right. If the copper used were chemically pure, the surface would be more or less bright, but there are always more or less impurities in it which causes the black discoloration mentioned. It is not harmful, however.

QUESTION No. 842. We send you some jewel setting used in watch movements. These settings are made of brass, and during the summer months they become covered with a whitish substance which has a crystalline appearance under the microscope. Can you give the cause of this and the remedy?

Answer. An examination of the settings indicates that the difficulty in the shape of the minute, white spots, is caused by the presence of lead in the brass from which they are made. Brass for this kind of work is frequently called "collet-brass" and a large amount of lead is used in it in order to render it very free cutting. From 4 to 5 per-cent of lead is usually employed in the mixture. Brass containing so much lead will turn white when exposed to dampness and with the appearance shown by your samples. The remedy is to use a brass with less lead as it has been found that such brass will not turn white as readily. From 1 to 2 per-cent can be used. The white spots mentioned are a basic carbonate or hydroxide of lead.

QUESTION No. 843. I have a large quantity of nickel solution to move a distance and wish to know if the nickel salts can be precipitated so as to avoid carrying the large amount of water?

Answer. You cannot precipitate the nickel in your solution in a successful manner and the only way is to put it in clean barrels for transportation.

QUESTION No. 844. How can the white, irregular spots be avoided in yellow brass castings? We make the castings from clock brass scrap and find considerable trouble, when the castings have been polished, with clouded or irregular spots as though some foreign material had become mixed with the metal. The spots are hard and do not show except when the castings are polished.

Answer. Your difficulty is apparently caused by the presence of oxide of zinc in your metal. The sample of the polished casting sent us indicates it. In melting the scrap, such as you use, which, we believe consists of chips and skeleton-scrap, there is so much surface exposed to oxidation that a large amount of dross is formed. It is difficult to remove it completely by skimming and some enters the castings. If you melt the scrap, skim and pour into ingots, then remelt and pour into your castings, you will have less difficulty. In melting ingot metals there is the least possible oxidation.

QUESTION No. 845. Would a cement tank be better than a wood one for rinsing work before and after plating?

Answer. Unless you want a tank of exceptional size, you will find a wood tank preferable. It is cheap and should last a long time when used only as a rinse tank. You had better coat it with pitch as it will preserve it from rotting.

QUESTION No. 846. We are sending you a sample of an aluminum casting used as a cap on a gasoline tank used on automobiles. You will note that a fine thread is cut on it, and

we experience difficulty in cutting the threads. We desired to cut the threads in the same manner as we do on brass. The aluminum seems to tear in cutting. What is the reason?

Answer. Your principal difficulty is that your mixture is too soft. It is apparently a soft aluminum and copper mixture that does not cut well. We suggest the following mixture for the work as it is cheaper and cuts much better:

Aluminum	75%
Zinc	20%
Copper	5%

If you find that you cannot cut the thread well, use kerosene oil on the tools.

QUESTION No. 847. I am experiencing some difficulty in obtaining a heavy brass plate on automobile hardware, such as levers, etc. I must obtain a heavy brass deposit of a rich yellow brass which I fail to get. I have been running the work for about 1¼ hours. The deposit is not uniform. Some parts, particularly at the bottom, are red or copper colored. The solution stands 11° Beaumé and I use from 3 to 4 volts. I first nickel the work about 15 minutes. Please let me know what to do.

Answer. Your solution is not quite strong enough to use for a heavy deposit. Add more copper carbonate and zinc carbonate to bring it up to about 15° Beaumé. Use warm. Then, if your work does not take an even yellow brass deposit, but is yellow on some portions and red on others, add more free cyanide. The formation of two colors on the work shows lack of free cyanide. If the whole deposit is too red, add more carbonate of zinc. You will have to run several hours, however, if you wish to obtain a very heavy deposit. Take out the work about once every hour and scratch brush, and then return. This will serve to produce a dense, smooth deposit.

QUESTION No. 848. We are anxious to obtain a mixture of spelter for making small castings weighing about 4 oz. in metal molds. What is the cheapest mixture for the work?

Answer. There is no mixture used for such work. The purest zinc (spelter) obtainable is employed. The purer the spelter is, the better the results. Impure or cheap spelter will crack in the mold. The same is true of mixtures containing spelter. Lamp bases, clocks, and a similar line of ornaments are made in large quantities of pure spelter and it has been found that for casting in metal molds, it is the only thing that can be used.

QUESTION No. 849. We have several tons of small steel goods made of soft steel that we have tumbled first and then nickel plated. The finish on them, however, is not as good as those made by our competitors and we are sending you a sample of our own and those of our competitors. Why should they be able to obtain the fine finish on them? They certainly cannot afford to buff them.

Answer. The reason that your competitors have been able to obtain a polished surface on their goods is that they have used steel balls in tumbling them, both before and after plating. The steel articles are first tumbled with a cutting down material, in order to give a surface for the next operation, and then tumbled with soap and steel balls, after which they are nickel plated and again tumbled with steel balls in order to polish the nickel. Steel ball tumbling is now extensively used for polishing small metal goods.

QUESTION No. 850. Will you advise us the mixture used for making nickeline castings. This mixture polishes up the same as nickel plated ware and we wish it for automobile work so that a solid metal will be had which will not wear off by polishing. Also advise if tubing can be made of it?

Answer. For your castings use the following:

Copper	50 lbs.
Zinc	35 lbs.
Nickel	15 lbs.
Aluminum	2 oz.

This mixture is very white and strong and is suitable for your work. You cannot make tubing of it, but you will have to use German-silver or cupro-nickel tubing. Iron-lined German-silver tubing is now made and is good for foot rails, etc., which you mention, and is also cheap.

QUESTION No. 851. What is the best method of throwing down the copper in an acid copper solution? We have heard that iron filings will do it. Is there anything better?

Answer. Iron filings or chips are too fine. Use old barrel hoops or similar sheet iron scrap as they are cheap and when the copper has been precipitated on the surface, it may be readily brushed off. Then, too, the iron is easily removed from the solution when all the copper has been precipitated.

QUESTION No. 852. Can as good aluminum castings be made from chips as from new ingot metal? We have heard that it cannot be done.

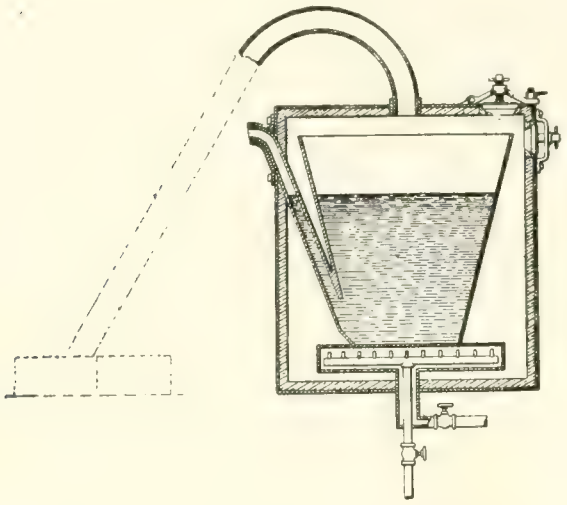
Answer. Every time aluminum is melted it is injured, as far as its tensile strength is concerned. While castings made from such aluminum may have as good an *appearance* as those made from new metal, their strength is always less. If you have much scrap to use, it is better to use a small quantity with each melt of new metal than to make an melt entirely of it.

QUESTION No. 855. Are ferro-chrome and ferro-tungsten used to any extent in the non-ferrous trades. These materials are now used to a large extent in the manufacture of steel and we desire to know whether they have any value in making brass, bronze or other copper alloys.

Answer. As far as known they are not used. Owing to their high melting point it is difficult to alloy them with copper alloys and we have never found that anyone has made experiments on this subject. Some experiments have been made upon the use of pure chromium in bronzes, but the ferro-alloys do not seem to have much attention.

Patent Abstracts.

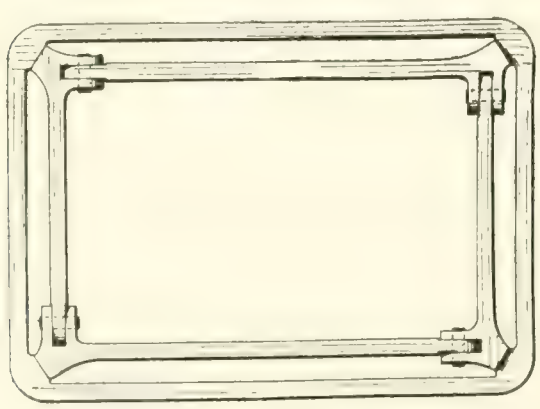
964,896, July 19, 1910. REDUCING METAL TO A MOLTEN STATE SUITABLE FOR CASTING. Wm. S. Brian of Memphis, Tenn. A method of casting metal from the



bottom by means of pressure. The crucible, of the shape shown, is enclosed in a tight box and pressure applied which forces out the metal. In order to prevent cooling, the bottom of the crucible is heated by a burner.

961,875, June 21, 1910. DEVICE FOR POLISHING BRASS. Carl E. Merrill of Lowell, Mass. An enclosed brush operated by power for polishing the brass plugs used on switchboards. It is intended for use in telephone exchanges, etc.

964,440, July 12, 1910. EQUALIZING SUPPORT FOR MOLDERS' FLASKS. Wilfred Lewis and Leroy Tabor of Philadelphia, Pa. Assignor to The Tabor Mfg. Co. of the same city. The invention is an equalizing cradle



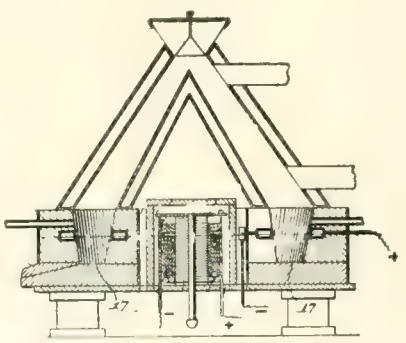
for use with large molds and which accommodates itself to the inequalities of the flask, and also to the movement of it which may be caused by a deflection of any part.

962,462, June 28, 1910. PROCESS OF REMOVING SCALE FROM PIPE. H. A. F. Peterson of Chicago, Ill. The apparatus is for the removal of the scale from the interior of iron pipe previous to galvanizing or electro-

galvanizing and is intended to obviate the usual pickling operation. The appliance is used with power and breaks up and loosens the scale as it passes over it.

962,655, June 28, 1910. APPARATUS FOR ELECTROPLATING PIPES. Daniel H. Murphy of New Castle, Pa. A plating tank for use in plating iron pipes (particularly electrogalvanizing them). The apparatus in the tank is so arranged that it can be reciprocated by power and thus move the pipes so that all portions are exposed to the solution during the plating.

962,532, June 28, 1910. ELECTRIC FURNACE FOR METALLURGICAL PURPOSES. Heinrich F. D. Schwahn of Belleville, Ill. An induction electric furnace here-

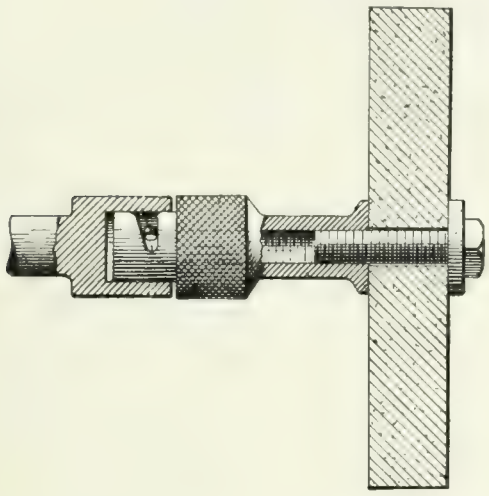


with illustrated and intended for the smelting of aluminum ores or the melting of metals. The novelty of the invention is in the construction of the furnace.

964,949, July 19, 1910. SUPPORT FOR THE INTERNAL MOLDS OF HOLLOW CASTINGS. G. Weinbeer of Nuremberg, Germany. A chaplet for holding a core in a mold. It is of peculiar shape and is made of sheet metal.

961,864, June 21, 1910. CUTLERY GRINDING MACHINE. Charles L. Joy of New Haven, Conn. An automatic machine for grinding knives and similar kinds of steel cutlery.

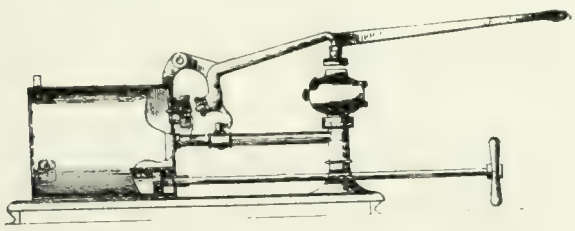
962,627, June 28, 1910. COUPLING FOR GRINDING AND POLISHING WHEELS. Michael Cummins of Bergenfield, N. J. A device for quickly detaching grinding, polishing or buffing wheels from the shaft upon



which they rotate. A coupling is provided with a hollow head and which engages a pin as shown. This pin engages in a slot and by a turn of the knurled head, the wheel may be removed.

964,722, July 19, 1910. APPARATUS FOR CASTING MOLTEN MATERIAL. Kirke West of New York. The dive is intended for use in the casting of type metal and is for the prevention of cooling and hardening of the molten metal in the duct leading from the melting pot.

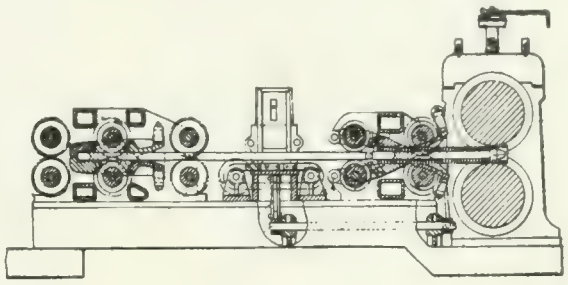
964,212, July 12, 1910. CASTING MACHINE. Francis A. Carter of Chicago, Ill. An appliance for casting metals by means of both pressure and a vacuum. The process is



applied more particularly to the casting of dental work. A perusal of the original drawing of the specification is necessary in order to comprehend the method used for carrying out the process.

964,566, July 19, 1910. MANUFACTURE OF ALUMINUM AND ITS ALLOYS. Heinrich F. D. Schwahn of Belleville, Ill. A mixture of aluminum sulphate and pitch is heated in the induction furnace described in Patent No. 962,532, June 28, 1910. The aluminum, it is claimed, is reduced to the metallic condition.

961,818, June 21, 1910. TUBE ROLLING MACHINE. Heinrich Stüting of Witten, Germany. A rolling mill for rolling seamless tubes. The improvement consists in arranging

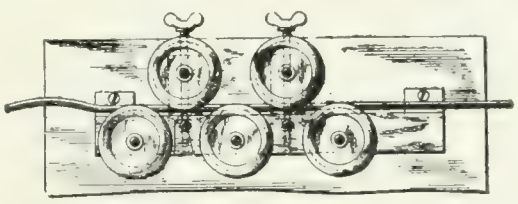


the two abutments of each mandrel and providing means whereby they are thrown out of operation automatically by the tube as it passes from one abutment to the next.

962,790, June 28, 1910. SCLEROSCOPE. Albert F. Shore of New York City. Assignor to the Shore Instrument Mfg. Co. An instrument for determining the hardness of metals by means of impact and obtaining a relative amount compared with a standard. Hard steel is taken as 100 and glass as 110.

962,553, June 28, 1910. APPARATUS FOR DRYING MOLDS. James C. Davis of Hinsdale, Ill. Assignor to the American Steel Foundries. A coil of pipe is rammed up with the mold and steam passed through it thus drying the complete mold in place without the necessity of carrying to an oven.

962,831, June 28, 1910. STRAIGHTENING MACHINE. John P. Haga of Minneapolis, Minn. A machine for straightening wire.



The machine is of the "five roll" type and the feature lies in the manner of adjusting the rolls.

964,192, July 12, 1910. TIN PLATE POLISHING AND CLEANING MACHINE. Wm. C. Vanneman of Anderson, Ind. A machine for cleaning and polishing tin plate sheets with bran. The feature of the invention lies in the construction of the machine so that the edges of the plates are cleaned and the bran applied where needed. A spiral elevator also elevates the bran from the bottom and again applies to the surface of the sheet.

Trade Items.

The Hobson Mfg. Co., have started a factory at 10 Lake St., Winsted, Conn., for the manufacture of metal novelties. Electroplating is carried on.

The Sterling Pin Company of Shelton, Conn. (P. O. address, Derby, Conn.) are installing an electroplating plant in connection with their works.

The Atlas Tack Company of Fair Haven, Mass., manufacturers of tacks, nails, escutcheon-pins, rivets, etc., are contemplating increasing their plating department.

The Western Brass Co., has been incorporated in Tacoma, Washington, with a capital stock of $5,000 to take over the business of the Lewis Bros. Brass & Machine Shop. J. S. and J. D. Lewis are the incorporators and a foundry and machine shop is to be built.

The Eccles Name Plate & Engraving Co., have started to manufacture etched brass name plates at 388 John St., Bridgeport, Conn. They are located in the plant of the Newfield Plating Co., who are doing the plating and coloring for them.

The new brass foundry of the Crown Cork & Seal Co., Guildford Ave., Baltimore, Md., manufacturers of bottling machinery, has been started. Three crucible furnaces have been installed with sand-blasts, core-ovens, etc. Small work is made and about 14 molders will be accommodated.

The Naugatuck Chemical Co., are sending out an announcement to the trade stating that they have terminated their selling arrangement with the Chas. E. Sholes Co., of New York City, and have organized their own sales department under the management of H. Stuart Hotchkiss. Acids and heavy chemicals are manufactured by the company.

The New Rochelle Refinishing, Bronzing & Plating Co., have opened a factory at 21 Cedar St., New Rochelle, N. Y., and will carry on the business of electroplating and refinishing of all kinds of silverware, chandeliers, brass beds, automobile trimmings and lamps, etc. The company consists of F. X. Trottier and J. D. Nickerson who are practical men in the business and will give personal attention to the work.

A new alloy called "Cupror-Bronze" has recently made its appearance on the market as an imitation of gold alloys. It is claimed by the makers, the Cupror Co., 50 Church St., New York City, that it is the nearest approach to gold known and has the color of 14 k. and 18 k. gold. It is also immune from ordinary atmospheric influences, as well as salt water and acids. It has specific gravity of 8.11 and in the casting, the tensile strength is said to be 80,000 lbs. per sq. in. It is recommended for work where brass is now employed as it will resist the atmosphere influences to a far greater extent. The makers believe that there is a large future open for it.

The Fulton Company of Knoxville, Tenn., manufacturers of thermo-sensitive devices, are to commence the manufacture of radiator valves. They already operate a brass foundry.

The Standard Electric Fitting Co., Elm Court, Stamford, Conn., recently installed an electrogalvanizing plant for electrogalvanizing some of their products that are used upon outside work.

The Premo Mfg. Co., of Newark, N. J., manufacturers of metal novelties, have moved from Lum St., to 120 Pacific St., and have also fitted up a new polishing and plating room.

The C. J. Root Co., Bristol, Conn., has recently placed on the market a new machine for automatically measuring the length of wire or other material in a similar nature. The wire is allowed to pass through two rolls and the length is automatically registered.

The Lumen Bearing Co., of Buffalo, N. Y., are sending out to the trade a booklet entitled "Ideal Bearings for Gasoline Engines" by C. H. Bierbaum, M. E. It contains much interesting and useful information on the subject and will be sent to those who desire it.

The name of the Pritchard-Strong Co., of Rochester, N. Y., has been changed to the Pritchard Mfg. Co. Household hardware and similar stamped metal goods are manufactured. No change in the management will be made. This company is one of the largest manufacturers of lanterns in the United States.

The plant and business of the Bay State Screw Co., of Hatfield, Mass., manufacturers of spark plugs and similar screw machine products, has been taken over by a new concern called the Hampshire Mfg. Co. The general offices are at 1779 Broadway, New York City. The same line of products will be made at the Hatfield plant.

A new plant for the manufacture of automobile radiators by electrodeposition is to be built by the Electrolytic Products Co., at Elmwood and Hertel Aves., Buffalo, N. Y. Two acres of land have been purchased for the purpose. The radiators are to be made of copper and are to be manufactured under patents owned by the company. Frank A. Abbott, 707 D. S. Morgan Building, is the secretary of the company.

The Acheson Oildag Co., of Niagara Falls, N. Y., has purchased a factory site of thirty acres in Port Huron, Mich., and will erect a new plant for the manufacture of their lubricating materials. This material is a mixture of graphite and oil, but the graphite remains in suspension. The process of making such graphite was discovered by Dr. Acheson, the inventor of carborundum and artificial graphite. It is expected that the material will soon come into very extensive use as a lubricant.

The American Electric Headlight Co., has been incorporated in Indianapolis, Ind., with a capital stock of $50,000 to manufacture electric headlights.

A new plant for the manufacture of stoves is being erected by the Ringen Stove Co., at Kingshighway and Daggett Ave., St. Louis, Mo., and which will give them a daily capacity of 1,500 stoves. The plant is to cost $500,000.

The W. Green Electric Co., 81 Nassau St., New York City, has secured the contract for polishing and buffing motors for the new torpedo station of the Government at Newport, R. I.

The first section of the new brass foundry to be built by the Crane Co., of Chicago, Ill., manufacturers of valves, is being erected. The foundry will be of concrete fire-proof construction.

The Economy Stove Co., are to remove their plant from Cleveland, Ohio to Sandusky, Ohio where new buildings will be erected and about 150 hands will be employed. Gas heating and cooking stoves will be made by the company and a new foundry erected.

The Blickensderfer Mfg. Co., of Stamford, Conn., manufacturers of typewriters, are now manufacturing a typewriting machine of aluminum and which weighs less than five pounds. It is intended for use by commercial travellers and others who are obliged to carry the machine with them.

Schwartz & Land, 357 Pearl St., New York City, buy and sell all kinds of drosses, grindings, skimmings and copper bearing bearing material, and are always ready to quote prices upon application. They also make a specialty of buying and selling dynamos of all kinds and desire to correspond with any one who has such goods to sell as attractive prices can be made.

The Winsted Hardware Company has been organized in Winsted, Conn., with a capital of $100,000 and will manufacture a line of upholstery hardware, and small brass goods. It is stated that the business is the reorganization of the Benjamin Richards Co., of that place and whose plant was destroyed by fire some time ago. Thurlow H. Bronson is the president of the new company; A. A. Griffin, secretary; and Stuart B. Camp, the treasurer.

The Coslett process of producing a black finish on iron and steel and protecting it from rust is now being extensively used in England. For all kinds of automobile fittings, bicycle parts, hardware and similar iron or steel goods it is particularly suitable as it is easily applied and does not affect the temper of the steel. Hard steel articles are treated with it as readily as soft steel. The process was brought out and patented by Thomas Watts Coslett, 70 Vittoria St., Birmingham, England who is selling it to the trade. A. E. Flavell of the company will shortly be in the United States to introduce the process to the trade and letters may be addressed to him care of THE BRASS WORLD.

The Johnson Mfg. Co., of Urbana, Orio, manufacturers of oil cans and other stamped steel goods, are to install a plating plant for copper plating their goods.

The plant of the Art Metal Mfg. Co., 80 Clifford St., Providence, R. I., has been purchased by John M. Howard who will continue to manufacture the same line of goods.

The Sterling Metal Co., recently incorporated in Cincinnati, Ohio, with a capital stock of $50,000 to manufacture metal office furniture, has taken temporary quarters at 77 Elm St., in that city.

The Fairview Foundry Co., who recently erected a new plant in Detroit, Mich., for making aluminum and iron castings for automobiles, are affiliated with the Chalmers Motor Co., of Detroit and will make castings for the Chalmers automobile.

The Slack Mfg. Co., of Springfield, Vt., are manufacturing a machine for cutting metals and which is known as the "Abrasive Metal Cutting Machine" on account of the use of an emery wheel for doing the cutting. Brass and steel tubing, one-half inch in diameter can be cut with a smooth joint in half a second. One inch cold rolled steel can be cut in 25 seconds.

The new plant of the Kroenert Smelting & Refining Co., at 6620 Kelly St., East Liberty, Pittsburgh, Pa., is now in operation. Two furnaces are installed for the smelting and refining of metals. Solder, babbitt-metals, and other white metals will be produced. M. M. Kroenert is the president of the company; E. J. Forse, vice-president; G. A. Kroenert, secretary and treasurer; and J. McDermott, superintendent. The new building is 50 x 75 feet.

Secret Service officers have been seeking parties in New York City who have been making a practice of "sweating" gold coins by the ancient shaking method. The coins are placed in a burlap bag and shaken for some time. The friction of the coins upon one another causes particles to be removed and which attach themselves to the bag. The bag is burned and the gold reclaimed from it. Microscopic examination of the coins thus treated revealed the method of "sweating" them.

The use of Lycopodium for a parting in making fine brass castings has been of long standing, and those who have not used it do not realize its great value. It is the pollen of a plant found in Russia and is an impalpable powder that easily passes through the meshes of the finest cloth. The "Pollitz" brand of Lycopodium has long been the standard and is produced by Wm. Pollitz & Co., of St Petersburg, Russia, and for whom Thos. M. Curtius, 5 Platt St., New York City is the agent in the United States. Every package bears the facsimile signature of Wm. Pollitz & Co., and users should specify this brand. Thos. M. Curtius will be pleased to send information about Lycopodium and those who wish to make fine brass castings should correspond with him.

The plant of the O. O. Storle Valve Co., at Kewaunee, Wis., valve manufacturers, is being dismantled and removed to Green Bay, Wis.

The plant of the United Zinc & Chemical Co., of Springfield, Mo., is being enlarged. At the present time 125 hands are employed.

The Troy Scale Co., has been incorporated in Troy, N. Y., with a capital stock of $100,000 to manufacture scales and weighing devices.

Albert A. Moers, 24 Stone St., New York City, is now making interesting quotations on pig tin in large and small lots. Only 98-88 per cent tin is handled.

The firm of M. A. Hunt Co., of Cincinnati, Ohio, manufacturers of iron and brass beds, has now been incorporated with a capital stock of $150,000.

The Cleveland Platers' Supply Co., 1838 Central Ave., S. E. Cleveland, Ohio, desire to inform the trade that by the use of their electric cleaning compound, the stripping and peeling of nickel deposits is avoided.

The United Brush Co., which has been located in Providence, R. I., for a number of years, have moved to Attleboro, Mass., and have taken part of the James E. Blake factory. Brushes for platers and manufacturing jewelers are manufactured.

The Karl Bracher Jr. Mfg. Co., Mechanic St., Newark, N. J., are now manufacturing agate bearings for fine balances and scales. Heretofore all these goods were made in Germany. The company have their own mine or quarry, for supplying the agate used, at Hot Springs, Arkansas.

The Eureka Pneumatic Spray Co., 276 Spring St., New York, manufacturers of lacquer sprays, are now manufacturing a new line of products, for use in the spraying devices, called "Lacquer Enamels." They would be pleased to send information about them on request.

The Eureka Steel Novelty Co., has absorbed the G. H. Davis Mfg. Co., and the Silver Wire Co., of Buffalo, N. Y., and the Twin City Mfg. Co., of Tonowanda, N. Y. They will also remove their plant from Buffalo to North Tonawanda, N. Y., where the plant occupied by the Twin City Mfg. Co., on Schenk St., is to be occupied. Various sheet metal and wire goods are manufactured, among which are garment hangers. New metal novelties will be added to their already extensive line.

The Foundry Specialty Co., of Cincinnati, Ohio, are now manufacturing "FLUXINE" for use in melting brass and bronze. It is claimed that it is the only flux that will make pure and clean metal out of all kinds of scrap, turnings, borings, etc., without injury to the metal or crucible. It also removes the iron from the brass or copper, and prevents oxidation and reduces the loss in melting. Blowholes are prevented and a greater tensile strength is obtained. It is put up in 50 lb. trial packages.

The Finkell-Hackmeister Chemical Co., of Pittsburgh, Pa., manufacturers and dealers in chemicals, are to erect a new three story warehouse.

The new brass and aluminum foundry of the Buick Motor Co., of Flint, Mich., which is now under way, will be completed by the last of the summer.

The New England Sherardizing Co., has been incorporated in Hartford, Conn., with a capital stock of $80,000 to carry on sherardizing (zinc coating).

The Waterbury Farrel Foundry & Machine Co., of Waterbury, Conn., have recently placed on the market a new machine for slotting screws.

The Cuproy Co., has been organized in New York City with a capital stock of $5,000 to manufacture special alloys. The incorporators are Lewis C. Smith, Theodore F. Conrad and A. J. Jollon.

The Bronze Metal Co., of New York City are now operating the brass foundry of the Erie R. R., at Meadville, Pa. W. H. Nichols, 30 Church St., New York City, equipped the plant with Berkshire molding machines and numerous other appliances.

The Bunting Brass & Bronze Co., of Alliance, Ohio, have drawn plans for a new brass foundry 54 x 250 feet. It will be of steel construction and fireproof. The plant will not be located in Alliance and it has not yet been decided where it will be situated.

The Bristol Company of Waterbury, Conn., manufacturers of recording instruments, are sending out a large and complete catalogue that has just been printed, describing the most important models of the instruments made by the company. The catalogue is illustrated in an excellent manner.

Walter Macleod & Co., East Pearl St., Cincinnati, Ohio, are sending to the trade a complete catalogue describing the line of oil furnaces for brazing, melting, annealing welding and hardening which they manufacrue. A large variety of foundry appliances are also described.

Frank L. Randel & Co., 197 Pearl St., New York City, and with works in Jersey City, N. J., and Chicago, Ill., manufacture a large number of specialties in chemicals and polishing goods and issue a price list which will be sent to those interested. They carry acetone, water-glass, all kinds of soaps, rosin, pitch, polishing compositions, alum, potash and soda and many other materials used in the metal trades.

The business of the National Temperature Gauge Co., of Bellows Falls, Vt., manufacturers of heat regulators, has been taken over by a new company called the Crandon Mfg. Co., organized for this purpose. The product will now be known as the Crandon heat regulator. The capital stock is $25,000. Considerable brass, bronze and aluminum castings will be used in the regulators.

J. R. Cadmus has started in the manufacture of jewelry at 56 Columbia St., Newark, N. J.

The Sun Stove Co., 13 Macomb St., Detroit, Mich., are entending their brass foundry department by taking on outside work.

A complete oxy-acetylene welding plant made by the Davis-Bournonville Co., of New York City is being installed in the U. S. Navy Yard at Bremerton, Washington.

The Sunlight Mfg. Co., of Tampa, Fla., are to erect a new plant, 80 x 200 feet and three stories high for the manufacture of automobiles. A complete equipment for manufacturing is to be installed.

Dieges & Clust, 23 John St., New York City, and factory at 41st St., and 4th. Ave., Brooklyn, are to open a store at 20 John St., New York City, and also will build an addition to their factory. They manufacture silver goods.

The Peerless Wire Goods Co., has been incorporated in Lafayette, Ind., with a capital stock of $10,000 to manufacture wire goods. E. R. Clegg, Elbert Jackson and E. Schilling are the directors.

The W. S. Rockwell Co., 50 Church St., New York City, manufacturers of furnaces for all kinds of work, are sending out to the trade a circular on spring fitting furnaces describing the character of the furnaces which they make for this work.

The C. F. Church Mfg. Co., of Holyoke, Mass., are placing on the market a new material called "Pyralin" for use in covering bath room furniture and other classes of woodwork. It is a pure white substance that is applied in sheet form by a patented process.

The Jones Cold Storage Door Co., of Hagerstown, Md., is having plans prepared for a new two-story building to be used for manufacturing their product. It will comprise electrogalvanizing rooms and finishing and assembling rooms.

The Northern Chemical Engineering Laboratories have been opened in Madison, Wis., to carry on investigations and experimental work. The lines of work to be undertaken includes alloys, metals and technical products. Prof. C. F. Burgess of the University of Wisconsin is at the head of the company.

The Tabor Mfg. Co., of Philadelphia, Pa., manufacturers of molding machines, have purchased 5 acres of land at Stockley St., in that city and will erect a new plant for the manufacture of their goods. The plans for the plant have been completed and it is expected that work will shortly be begun.

The Dings Electro-Magnetic Separator Co., of Milwaukee, Wis., manufacturers of the "Dings" machine for separating iron from brass and other material, are sending out to the trade a small mirror intended for use in the brass foundry where it will be found useful in reflecting light into the deep portions of the mold. It will be sent to those who desire it.

The Ryder Brass Foundry of Bucyrus, Ohio, expect to have their new building equipped by August 1st, and in operation.

Siebel & Rosner have started an electroplating shop at 52 Broome St., Newark, N. J., and will carry on gold and silver plating.

A new factory is to be built by the Angldile Computing Scale Co., of Elkhart, Ind., manufacturers of computing scales. The factory will cost $75,000.

The McIntyre Watch Co., of Kankakee, Ill., which recently started in the manufacture of watches, have had plans drawn for a new factory. It is expected that their goods will be on the market by the last of the year. F. H. Corthell is the general manager and Hugo Haselquist the superintendent. A high grade watch only wilil be manufactured.

Personals.

Wm. A. Beveridge has resigned his position as foundry foreman of the plant of the Bridgeport Deoxidized Bronze & Metal Co., of Bridgeport, Conn.

Wm. E. Chase has resigned his position as manager of the United States Gas Furnace Co., of Providence, R. I., and has been succeeded by T. F. Hill.

George E. Rowe has resigned his position as salesman for the Jonathan Bartley Crucible Co., of Trenton, N. J., and has returned to his former position with the Pennsylvania R. R.

A. E. Flavell, representing Thomas Watts Coslett, 70 Vittoria St., Birmingham, England, the inventor of "Coslettizing," will shortly visit the United States in order to introduce the process in this country.

Martin A. Heanue, formerly with the Weld Mfg. Co., of Bridgeport, Conn., is now general manager of the Seymour Metal Goods Co., of Seymour, Conn., which recently started in the manufacture of small metal goods.

Wm. E. Roche has resigned his position as foreman of the plating and polishing departments of the American Graphophone Co., of Bridgeport, Conn., and has accepted a similar position with the Eastman Kodak Co., of Rochester, N. Y.

J. C. Rock has resigned his position as foundry foreman of the Whitlock Coil Pipe Co., of Hartford, Conn., and has returned to his former position as foreman of the brass foundry of the Bridgeport Deoxidized Bronze & Metal Co., of Bridgeport, Conn.

Obituary.

George Zucker, the founder of the George Zucker Co., of Newark, N. J., one of the largest manufacturers of polishing and buffing compounds in the United States, died on June 15th, at his home in East Orange, N. J. At the time of his death he was president of the company.

Current Metal and Supply Prices.

These Prices are net and are for moderate quantities. Smaller quantities command higher prices. Prices subject to fluctuation.

Acetone, pure, 98-99%	lb.	.22
Acid, Acetic, pure, 30%	lb.	.07
Acid, Arsenious (White Arsenic)	lb.	.20
Acid, Benzoic	lb.	.55
Acid, Boracic (Boric), pure	lb.	.12
Acid, Hydrochloric, see Acid, Muriatic.		
Acid, Hydrofluoric, 30%	lb.	.04
Acid, Hydrofluoric, 50%	lb.	.10
Acid, Muriatic, 20°	lb.	.02
Acid, Muriatic, c. p., 20°	lb.	.07
Acid, Nitric, 38°	lb.	.05⅝
Acid, Nitric, 40°	lb.	.05⅞
Acid, Nitric, 42°	lb.	.06¼
Acid, Nitric, c. p.	lb.	.08
Acid, Sulphuric, 66°	lb.	.01¾
Acid, Sulphuric, c. p.	lb.	.06
Alcohol, Wood	gal.	.50
Alcohol, Denatured	gal.	.55
Alum	lb.	.04
Aluminum, Sulphate	lb.	.06
Aluminum, Metallic, in Ingots	lb.	.23
Aqua-Fortis, see Acid, Nitric.		
Ammonia Water (Aqua-Ammonia), 20°	lb.	.04¾
Ammonia Water (Aqua-Ammonia), 26°	lb.	.06¼
Ammonia Water, c. p.	lb.	.08
Ammonium Carbonate, lump	lb.	.15
Ammonium Chloride (Sal-Ammoniac)	lb.	.12
Ammonium Hydrosulphuret	lb.	.30
Ammonium Sulphate	lb.	.07
Ammonium Suphocyanate	lb.	.50
Amyl Acetate	gal.	1.85
Antimony	lb.	.08⅛
Arsenic, Metallic	lb.	.15
Arsenic, White (Acid Arsenious)	lb.	.20
Argols, White (Cream of Tartar)	lb.	.31
Asphaltum, Commercial	lb.	.05
Asphaltum, Egyptian (Bitumen)	lb.	.30
Benzine	gal.	.15
Benzol, Pure	gal.	.75
Bismuth, Metallic	lb.	2.00
Bitumen, see Asphaltum.		
Blue-Vitriol, see Copper Sulphate.		
Borax, Crystals or Powdered	lb.	.10
Borax Glass	lb.	.35
Cadmium, Metallic	lb.	.70
Carbon Bisulphide	lb.	.10
Calcium Carbonate (Precipitated Chalk)	lb	.10
Chrome-Green	lb.	.50
Copper, Lake, (carload)	lb.	.12¾
Copper, Lake, (cask)	lb.	.13
Copper, Electrolytic, (carload)	lb.	.12½
Copper, Electrolytic, (cask)	lb.	.12¾
Copper, Casting, (carload)	lb.	.12⅜
Copper, Casting, (cask)	lb.	.12⅝
Copper Acetate (Verdigris)	lb.	.35
Copper Carbonate, dry	lb.	.25
Copper Sulphate (Blue-Stone)	lb.	.09
Copperas, see Iron Sulphate.		
Corrosive Sublimate, see Mercury Bichloride.		
Cream-Tartar, see Potassium Bitartarate.		
Cryolite	lb.	.12
Cyanide, see Potassium Cyanide.		
Dextrin	lb.	.15
Emery Flour	lb.	.04
Emery, F F & F F F	lb.	.03
Flint, powdered	lb.	.01
Fluor-Spar	lb.	.01¼
Fusel-Oil	gal.	1.75
Gold Chloride	dwt.	.60
Gum Copal	lb.	.30
Gum Guiacum	lb.	.26
Gum Mastic	lb.	.70
Gum Sandarac	lb.	.35
Gum Shellac, brown	lb.	.50
Gum Shellac, white	lb.	.60
Iron Perchloride	lb.	.25
Iron Sulphate (Copperas)	lb.	.05
Lead Acetate (Sugar of Lead)	lb.	.15
Lead, Pig	lb.	.04½
Lead, Red	lb.	.12
Lead, Yellow Oxide (Litharge)	lb.	.12
Liver of Sulphur, see Potassium Sulphide.		
Manganese, Ferro, 80%	lb.	.10
Manganese, Metallic, pure	lb.	.75
Magnesium, Metallic	lb.	1.50
Mercury Bichloride (Corrosive Sublimate)	lb.	.93
Mercury, Metallic (Quicksilver)	lb.	.50
Mercury Nitrate	lb.	1.50
Mercury Oxide, yellow	lb.	1.80
Nickel and Ammonium Sulphate (Double Salts)	lb.	.16
Nickel Carbonate, dry	lb.	.60
Nickel Chloride	lb.	.50
Nickel Metallic	lb.	.47
Nickel Sulphate (Single Salts)	lb.	.25
Nitre (Saltpetre), see Potassium Nitrate.		
Oil of Vitriol, see Acid, Sulphuric.		
Paraffine	lb.	.15
Phosphorus, yellow	lb.	.40
Phosphorus, red	lb.	1.10
Pitch	lb.	.05
Plaster of Paris, Dental	bbl.	4.00
Platinum Chloride	oz.	18.00
Platinum Metallic	oz.	34.00
Potash-by-Alcohol, in sticks	lb.	.50
Potash, Caustic (Potassium Hydrate)	lb.	.08
Potassium Bichromate	lb.	.14
Potassium Bitartarate (Cream of Tartar)	lb.	.31
Potassium Carbonate (Pearlash)	lb.	.10
Potassium Chlorate	lb.	.15
Potassium Cyanide	lb.	.25
Potassium Iodide	lb.	2.25
Potassium Nitrate (Nitre or Saltpetre)	lb.	.10
Potassium Permanganate	lb.	.17
Potassium, Red Prussiate	lb.	.60
Potassium, Yellow Prussiate	lb.	.24
Potassium Sulphide (Liver of Sulphur)	lb.	.15
Potassium Sulphuret, see Potassium Sulphide.		
Potassium Sulphocyanate	lb.	.70
Pumice, Ground	lb.	.05
Quartz, Powdered	lb.	.01
Rosin, Yellow	lb.	.04
Sal-Ammoniac, see Ammonium Chloride.		
Sal-Soda, see Sodium Carbonate.		
Silver Chloride, dry	oz.	.75
Silver Cyanide	oz.	1.00
Silver, Fine	oz.	.53⅛
Silver Nitrate, crystals	oz.	.50
Soda-Ash	lb.	.05
Sodium Biborate, see Borax.		
Sodium Bisulphite	lb.	.15
Sodium Carbonate (Sal-Soda), crystals	lb.	.02
Sodium Hydrate (Caustic Soda)	lb.	.05
Sodium Hydrate (Caustic Soda) by Alcohol (in sticks)	lb.	.45
Sodium Hyposulphite ("Hypo")	lb.	.04
Sodium Metallic	lb.	.90
Sodium Nitrate	lb.	.05
Sodium Phosphate	lb.	.09
Sodium Silicate (Water-Glass)	lb.	.04
Soot, Calcined	lb.	.15
Spelter, see Zinc.		
Sugar of Lead, see Lead Acetate.		
Sulphur (Brimstone) in lump	lb.	.05
Tin Chloride	lb.	.43
Tin, Metallic	lb.	.33½
Turpentine, Venice	lb.	.35
Verdigris, see Copper Acetate.		
Water, Distilled	gal.	.15
Water-Glass, see Sodium Silicate.		
Wax, Beeswax, yellow	lb.	.45
Wax, Carnauba	lb.	.70
Whiting (Ground Chalk)	lb.	.02
Zinc Carbonate, dry	lb.	.19
Zinc Chloride	lb.	.12
Zinc, Sulphate	lb.	.06
Zinc, (spelter)	lb.	.05¼

THE

BRASS WORLD

AND

PLATERS' GUIDE

VOL. VI. BRIDGEPORT, CONN., SEPTEMBER, 1910. No. 9.

A MONTHLY JOURNAL

devoted to the Art of Refining, Alloying, Casting, Rolling, Founding and Electroplating of all the non-ferrous metals and their alloys.

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Chromium Alloys.

Chromium has always been one of the most interesting of the metallic elements, and while in former times it was always classed as a "rare" element, it was customary, at that time, to consider an element rare when it was difficult to prepare it in the metallic condition. Titanium and silicon, two of the most common elements, were formerly considered as "rare elements". Recent electrolytic and alumino-thermic methods have made it possible to reduce chromium to the metallic condition quite cheaply so that it can now be called one of the common metals.

Chromium seems to be a hardening metal when alloyed with other metals, and as evidence of this fact, chrome-steel, that has long been in use in the manufacture of burglar-proof vaults, may be cited. This steel resists the action of any known cutting tool. When alloyed with other metals besides iron, chromium has a hardening action and there is undoubtedly an extensive field open in this direction. The alloys of cobalt and chromium, discovered by Elwood Haynes, and described elsewhere in this issue are evidences of what can be done in making chromium alloys. When such alloys will take a cutting edge that rivals the best steel, it indicates that they are worth considering. While the use of non-ferrous cutting tools has, heretofore, not offered much inducement on account of the fact that their cost would be higher than steel with no better results, in this particular case, the alloys of chromium are so non-cor-

rosive and so hard that there are undoubtedly many uses for which they will be found particularly adapted. Mr. Haynes says: "I believe that the alloy of cobalt and chromium is the only non-ferrous alloy that combines the cutting qualities of steel with the non-tarnishing qualities of gold and platinum, that can be made in sufficient quantity, and at a price that will permit of its general use for small cutlery, such as pocket knives, table knives, fruit knives, carvers and surgical instruments."

The results that have followed the use of chromium in alloys have been so satisfactory that it is believed that many new and valuable alloys are still to be found containing it.

Brass Plating Automobile Parts.

The use of the automobile has created a large demand for brass plating. While the majority of the parts, or automobile hardware, as they are called, are made of solid brass, there are others that must be made of steel or iron in order to obtain strength, and as such portions must match the solid brass parts, brass plating is brought into play. In the manufacture of cheap automobiles, too, many of the parts usually made of brass on an expensive car are made of malleable or gray iron, and these also are brass plated.

The demand in the automobile trade is for a *heavy* brass deposit. One that will stand wear, or as one automobile manufacturer recently said to us: "A brass deposit that will stand scouring as well as solid yellow brass." Let it be understood that such a deposit cannot be produced, and the only approach to it is by means of close-plating which consists in soldering a sheet of brass on the article. Close-plating, however, is quite costly and in many cases, is more expensive than solid brass so that for cheap work, particularly, it is out of the question.

As far as a *heavy* electrodeposit of yellow brass is concerned, we can safely say that it is a very difficult matter. Brass is not deposited rapidly from a brass solution, and when the deposit is forced by the use of a strong solution and heavy current, it is not only hard and brittle, but blistered. The best method, and practically the only one that can be employed, is to deposit the brass in the regular manner and from the regular brass solution so that the desired color and softness are obtained, and then, after a time, take the article out of the solution and scratch brush the deposit. Then return and allow the deposition to continue. The scratch brushing may be continued as desired until a good thickness is obtained. If attempts are made to force the deposit, it will be so hard when it becomes fairly thick, that it is apt to flake off.

The formation of a fairly heavy brass deposit takes from 4 to 5 hours with scratch brushing at frequent intervals. If less time is taken, the deposit is not very heavy and a longer time, of course, will give a thicker coating. Even the thickest brass deposit that can be obtained by electrodeposition will not stand much scouring, and it should be borne in mind that at its best it is only a mere film and must be so considered. To obtain a heavy brass deposit like that which can be obtained in copper from an acid copper solution is an impossibility.

Hard Platinum and Iridium Alloys.

Comparatively little pure platinum is used at the present time as it has been found too soft for the majority of purposes. Ordinarily the platinum of commerce is alloyed with iridium in order to harden it. The majority of platinum used in electrical apparatus for spark points, etc., is an alloy of platinum and iridium as it is not only harder but more infusible than the pure metal.

As now found on the market, the so-called hard platinum is an alloy of platinum and iridium and is made in a number of different percentages. Ordinarily it is sold in the following proportions:

Platinum	*Iridium*
97½%	2½%
95%	5%
90%	10%
85%	15%
80%	20%

These alloys are made in the form of sheet and wire. The pure platinum on the market ranges from 99.7 to 99.8 per-cent in purity.

Lead is the only metal that is not penetrated by radium rays and is used as a protective lining to the so-called "radium safe" used for containing and preserving it.

A Holder for Use in Pouring a Crucible with a Shank.

By Philip Duffy.

Small crucibles, say No. 16 or under in size, may be poured by one man, and the molder himself usually needs no help. If a crucible larger than No. 16 is used, a rod is passed through a hook in the crucible tongue, and held by two men, the metal is poured into the mold. When a crucible of considerable size is used, say No. 50 or over, a shank is used for holding the crucible and this is also operated by two men. Such a shank is shown in Fig. 1. will frequently allow the crucible to slip while the pouring is being done and thus interfere with the molder's work. Every molder who pours with a shank knows how bad it is to have the crucible held back by a man who is careless, and when the mold is about half-filled, to have the crucible slip in the shank and a large quantity of metal slop over the top of the cope to run down risers or cover vents in the sand.

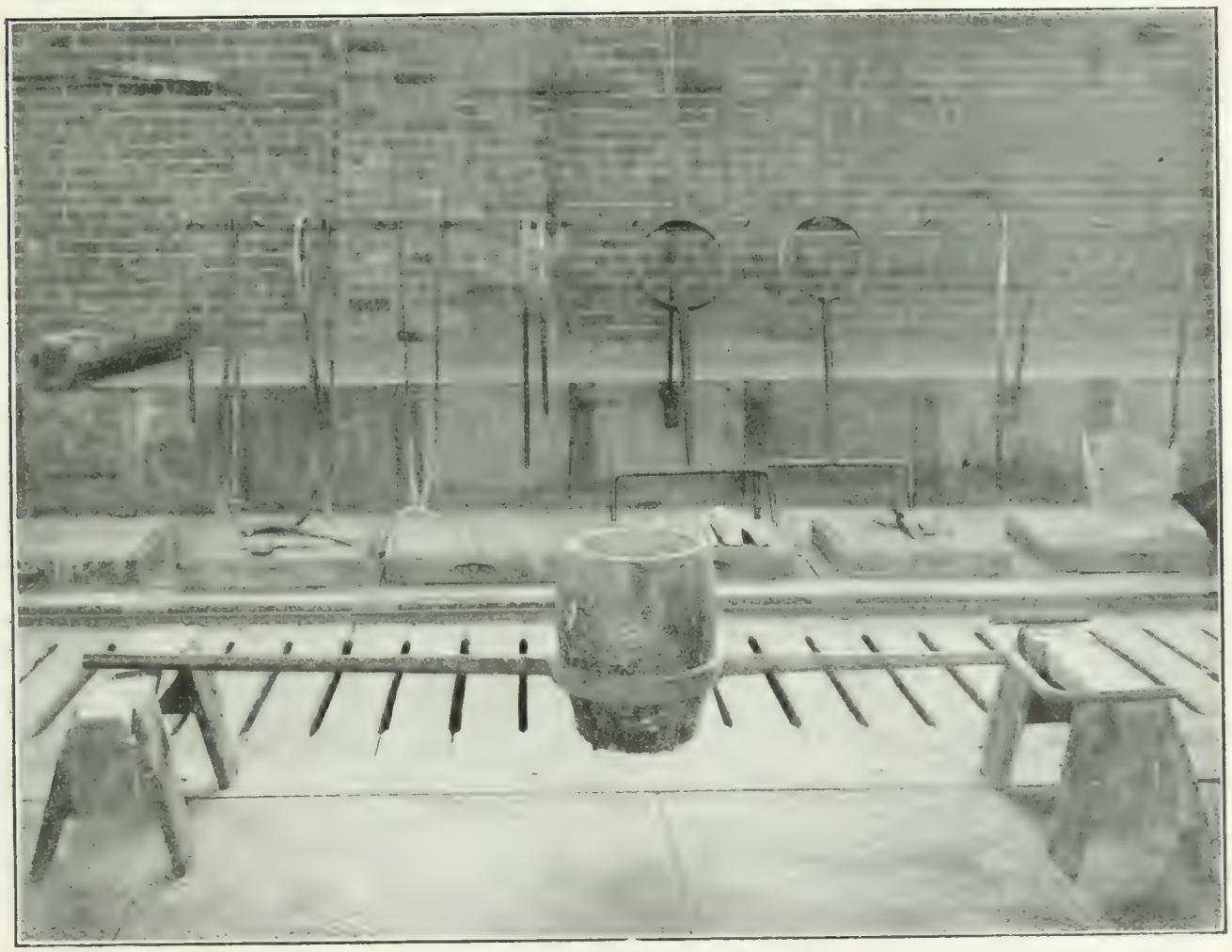


Fig. 1. Usual Method of Holding a Crucible in a Shank for Pouring

In pouring a crucible by means of a shank, the molder does the pouring and his helper holds the end of the shank. A third man, however, is required to "hold-back" the crucible and prevent its falling out of the shank as it is tipped forward to pour. The use of this third man is frequently an obstacle in a brass foundry, as it not only requires the services of an extra man, but takes his time from other work. Unless he is fairly intelligent, too, he

For some time past I have been using a holder for the crucible when a shank is employed for pouring it. This holder I designed and constructed for use in my own foundry and it has been in use with good results. It dispenses with the third man or the one who "holds-back." Not only is his time saved, but the results obtained are positive.

The holder consists of a hook and cam-lever shown in Fig. 2. The top of the hook

fits over the top edge of the crucible while it is in the shank, and the bottom hook catches the bottom of the shank-ring. The manner in which the holder is used on the shank may be understood by referring to Fig. 3 in which a sketch of a shank and the holder is shown.

Fig. 2. The Holder.

The holder really is composed of three parts: The top hook which fits over the top of the crucible. The bottom hook which catches the shank, and the lever. This lever has a cam at its end so that when it is moved, the cam presses against the two portions and tightly locks them.

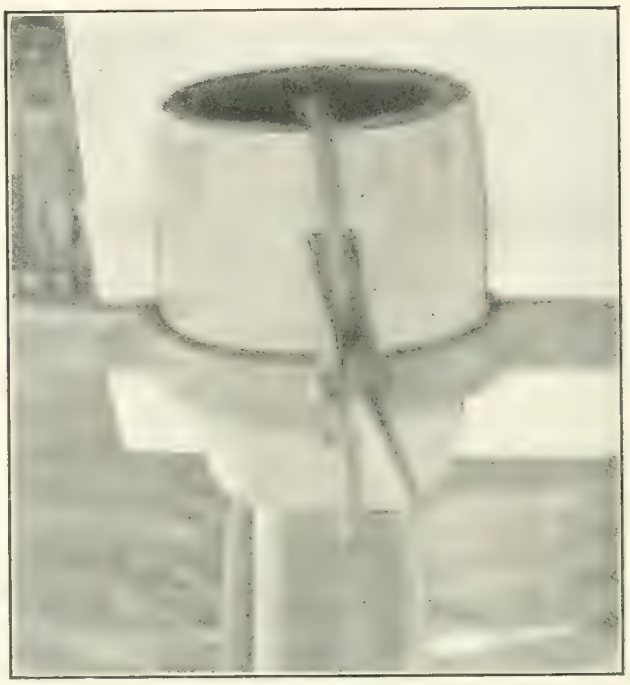


Fig. 4. The Holder and Crucible.

The method of using the holder is as follows: The crucible with the metal in it is placed in the shank and the hooks inserted in the top of the crucible and bottom of the shank, and then the cam-lever is moved by the hand or by a skimmer so that the hook is locked in a secure manner. In Figs. 4 and 5 the manner in which the holder works can be seen. The hook at the top may be made of

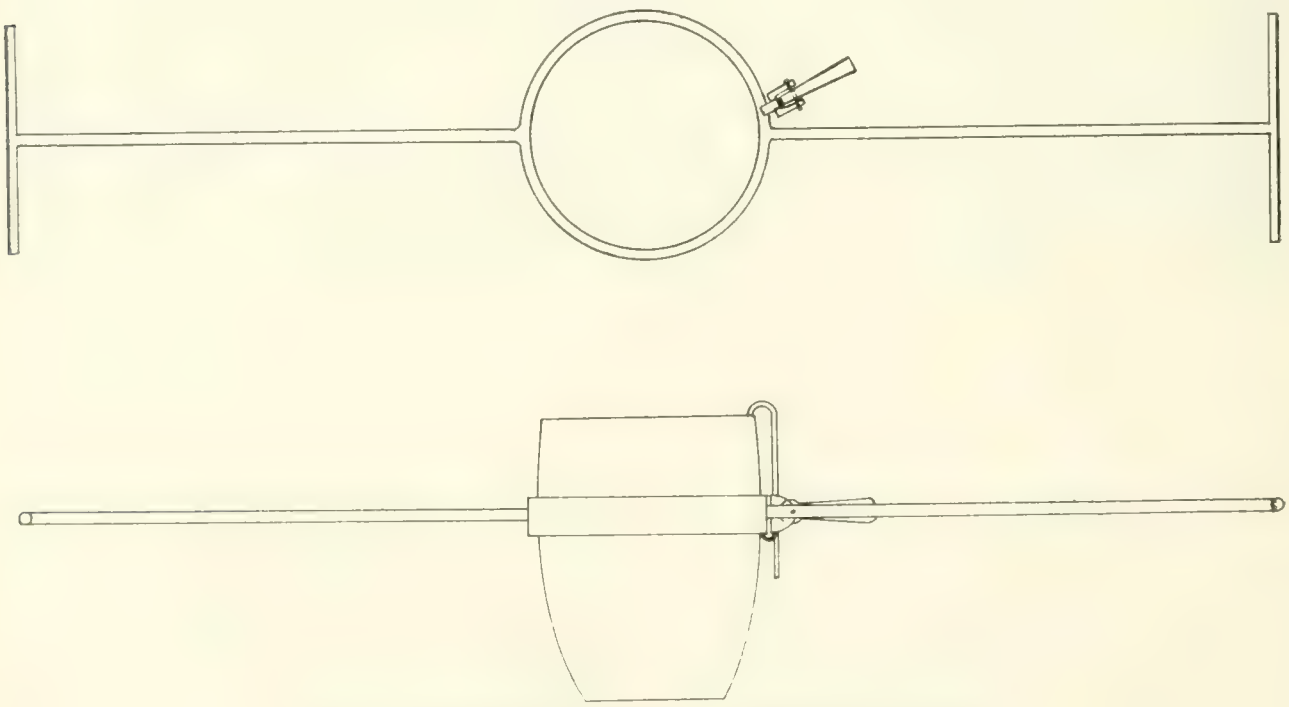


Fig. 3. Sketch Showing Manner of Holding the Crucible.

sufficient length to fit a number of different sized crucibles.

By the use of this holder, the crucible may be turned upside down without falling out the shank. The use of a third man is, therefore, dispensed with and the crucible held in the shank with certainty.

Standardizing Molding Flasks.

By Merritt W. Griswold.

In THE BRASS WORLD, August 1910, page 270, reference is made to the disadvantage of not having foundry flasks standardized. The want of this is a great drawback to young concerns just starting in business without a brass foundry of their own.

On the strength of some investigations I have made, I have worked out a simple system that can be easily followed for all ordinary size flasks. I have placed the pin-holes one and one-half (1½) inches outside of the inner edge of the flask, for the reason that it registers with 38 millimeters; and as to the distance apart along the side, I take three-tenths (3/10) the length of the flask from the center as fixed by the following formula:

Formula for U. S. Standard Foundry Flasks.

On account of the variation of castings for flasks, all measurements as to list sizes must be made on the inside at the parting line, and the sizes listed at the full half inch found next below the actual measurement. To illustrate: Should the actual width be 12-5/8 inches and the length say, 14-3/16 inches, it must be listed as 12½ x 14 inches.

The location of the pin holes is not to be made from the actual measurement of the flask, but from the list size as same is provided for above.

In locating the pin-holes, the measurements must be made from lines drawn at right angles through the actual center of the flask, and the distance apart along the sides of the flask from centre to centre of the pin-holes must be exactly three-fifths (3/5) of the list length, (or 3/10 from the actual center line). The distance apart across the flask must be exactly three inches (3 inches) greater than the list width, or one and one-half (1½) inches more than from centre line to centre of pin-holes.

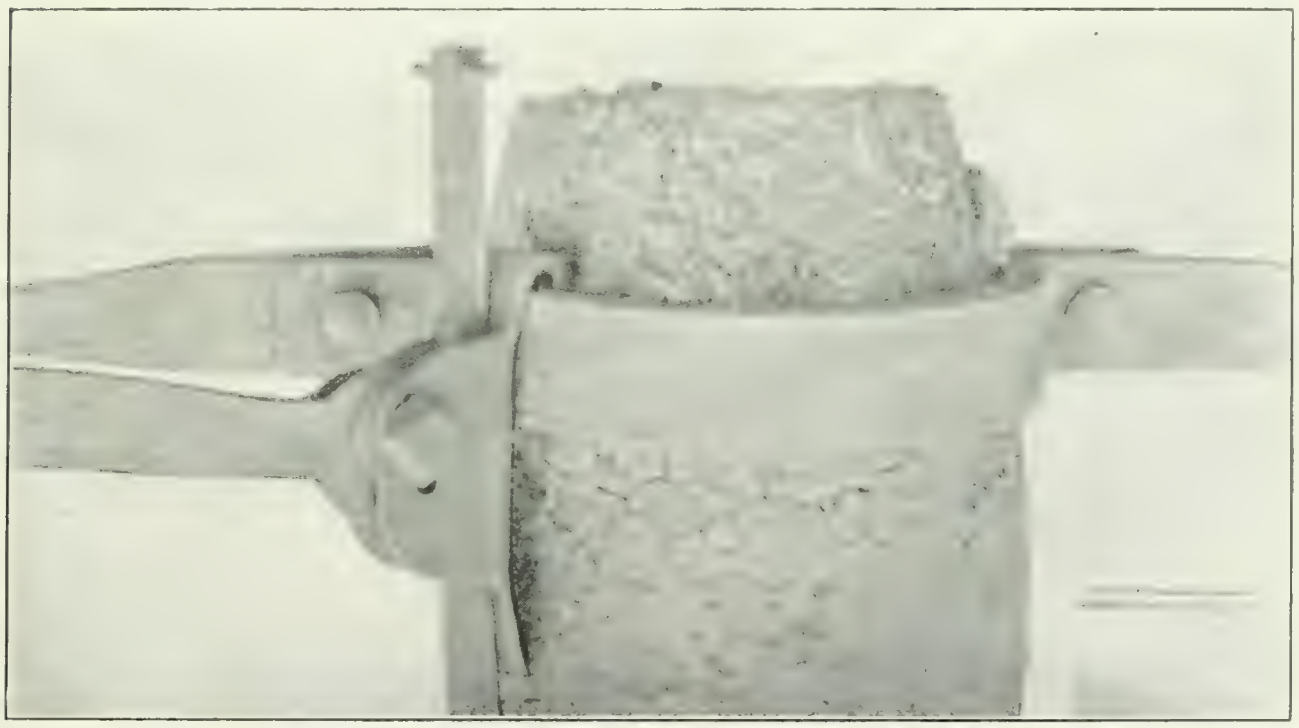


Fig. 5. Crucible in Shank and Turned Up-Side-Down Showing the Manner in which it is Held.

For flasks of less than 500 square inches of surface measure, the pin-holes must be exactly half an inch in diameter (1½ in.)

The above applies to flasks of all depths.

If every brass foundryman would insist upon having all new flasks made of standard size, he would be able to secure orders for castings where parties want their patterns on match plates.

Making Aluminum Castings to Stand Pressure.

Brass founders who cast aluminum are now and then called upon to make castings, such as valves or similar articles, to stand water or air pressure. They almost invariably fail and when a casting is actually obtained, it is more of an accident than anything else. To make aluminum castings to stand pressure they will have to be extraordinarily thick and even then a large proportion of them will leak, especially if they have to stand much pressure. To make castings of aluminum of the same thickness as those of bronze ordinarily used for steam-metal goods, and have them remain tight under pressure is simply out of the question.

The reason for the leakage of aluminum castings under pressure is the fact that more or less oxide of aluminum is always intermingled with the metal in a casting. There is no method known for preventing it. Could it be done, almost perfect castings would be produced. As the oxide of aluminum is white, when it is mixed with the metal it does not show so that one is quite apt to believe that the castings are good, inasmuch as they "look well." The more aluminum is melted the greater the proportion of this oxide present so that the best results are invariably obtained from new metal.

If it is actually necessary that castings be made of aluminum that will stand pressure, let new metal be used exclusively and that which contains zinc if possible as such mixtures have a closer grain and cast sounder than the aluminum and copper alloys although, of course, they are more apt to crack in the mold. As the castings will probably be small, there will be no difficulty in making them quite free from shrinkage cracks if a soft core is used. A mixture that is good for such a purpose consists of the following:

Aluminum	80%
Zinc	15%
Copper	5%

This mixture will also turn or cut well. It is less apt to cast with pin-holes than the aluminum and copper mixtures.

We cannot recommend the use of aluminum castings to stand pressure, but if they must be used, then make them as thick as possible and do the best that is possible with new metal. Under the most favorable conditions, the making of such castings is a difficult matter and in many shapes or pressures *impossible.*

A New Non-Corrosive Iron-Nickel-Copper Alloy.

A new and remarkable alloy of iron, nickel and copper has been discovered by G. H. Clamer of the Ajax Metal Co., of Philadelphia, Pa. This alloy is remarkable for two reasons: First, it is quite non-corrosive, although containing considerable iron. Second, although a ternary alloy that is usually not particularly malleable or ductile, it has a high elongation and reduction of area so that it may be rolled into sheet or drawn into wire. The alloy may vary somewhat in the proportions of iron, nickel and copper and the following limits are given:

Iron	30 to 70%
Nickel	25 to 50%
Copper	5 to 20%

Small quantities of impurities may be present without seriously affecting the properties of the alloy. Carbon does not injure it appreciably as it has been found that the following proportions of metals:

Iron	65%
Nickel	25%
Copper	10%

and containing 0.2 per-cent of carbon has the following approximate properties:

Tensile Strength	96,100 lbs. per sq. in.
Elastic Limit	51,750 lbs. per sq. in.
Elongation in 2 in.	42%
Reduction in Area	53.7%

It is proposed to make the alloy directly from an ore containing the sulphides of nickel, iron and copper. The ore is first smelted with a flux to produce a matte. The matte is then Bessemerized to remove the excess of iron, after which it is roasted to remove the sulphur and convert the metals into oxides. These oxides are then reduced by carbon to metal. The addition of any of the three metals—iron, nickel or copper—can then be made to bring the alloy to the desired composition.

The process of making this alloy has been patented by Mr. Clamer (U. S. Patent 965,871, Aug. 2, 1910) and another application has been filed in which the alloy is claimed.

Notes on the Method Employed for Refinishing Old Chandeliers and Gas Fixtures.

The refinishing of old chandeliers, gas fixtures and lamps has now become one of the principal kinds of work of the jobbing plater; and it is probable that the future will find it an even more extensive business. In the early days of the jobbing plater, the re-plating of silver flat-ware and hollow-ware was his most important work, but owing to the very low price of such wares at the present time, he finds it quite difficult to do such work at a price that will enable him to obtain much business. This is brought about by the fact that the refinishing of such goods as old steel knives frequently requires more labor than new ones will cost. The refinishing of old chandeliers and similar classes of articles, however, is not a difficult matter and if a plater is adept in the business he can often surprise his customer by returning to him the chandelier with a better finish than it originally had, particularly if it is an old one and never had any of the modern finishes upon it. When such is the case, the customer will often regret that he did not have it re-finished before.

Old chandeliers and similar classes of articles are almost invariably made of brass except in rare instances where, perhaps, iron may be used. If of bronze or copper, the method of re-finishing remains the same; but iron, of course, requires special treatment in the final finishing. It is so rare, however, that iron goods are found that only passing mention need be made of them. Now and then portions of a chandelier are made of soft metals and care should be taken in treating such parts. They are readily distinguished when the chandelier is taken apart and are usually composed of lead, antimony and tin, or lead and antimony.

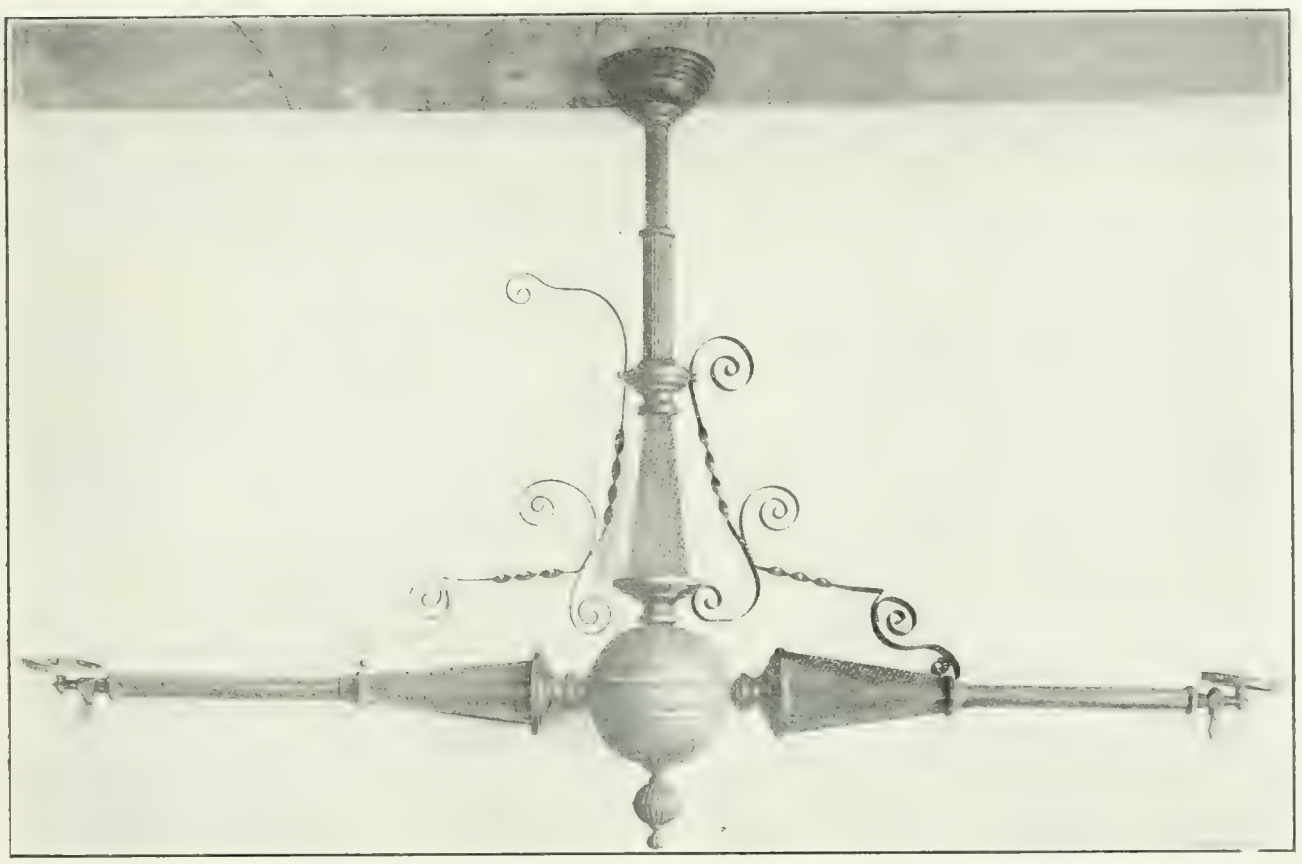


Fig. 1. The Old Chandelier as Received for Refinishing.

Old chandeliers may range all the way from those which are in pretty good condition to ones which are badly corroded. The usual difficulty is the presence of fly-specks which not only turn the metal black, but actually corrode and pit it. If a chandelier is not fly-specked, but the lacquer is removed in spots, then it frequently happens that only a very little refinishing is necessary and it need not be taken apart. Remove

the lacquer on it by means of lacquer thinner and refinish the portions that are stained by hand and then re-lacquer. It is rare, indeed, that one in such a condition is brought to a job plater and those which he encounters are badly fly-specked and tarnished. All the lacquer has often disappeared and the whole surface is badly blackened or turned green in spots.

Making a Drawing

In order to re-finish an old chandelier it is always necessary to take it all apart. When this is done the large number of pieces will frequently surprise one. The chandelier herewith illustrated was composed of 63 separate pieces. It is an easy matter to take it apart, but when it comes to putting it together again the problem is quite different, and it will readily be appreciated that with so many pieces and nearly all different, it will usually perplex anyone who is obliged to assemble them. Could they be taken and laid in position, then the problem would not be difficult, but this would not pay. The customary method, therefore, is to make a rough sketch of it as shown in Fig. 2 so that the position of each piece may be seen. This is not a difficult job. In case a camera is had, a photograph is even better and will assist a plater in an excellent manner.

Taking the Chandelier Apart

In order to re-finish a chandelier it is necessary to take it apart otherwise it could never be done. As ordinarily made, it consists of a skeleton of iron pipe in the form of a T and over this pipe the brass tubing and spun parts are placed. In order to take it apart it is necessary to have a pair of pipe tongs. Start first at the gas cocks on the ends and remove them. When this is done some of the tubing and spun parts will slip off readily and it can then be seen how the chandelier is made. In taking it apart, however, be careful not to grasp any of the brass parts (except the cocks) with the tongs as it is unnecessary and will greatly injure the surface if done. The chandelier will come apart without it.

When the chandelier has been taken apart, unscrew the iron pipe from the T at the center so that it may be put together again in a gas-tight manner. Old chandeliers frequently leak at the joints so that it is preferable, when it is taken apart, completely to dismantle it and start from the beginning. There will then be no complaint from the customer, when he places the re-finished chandelier in use, that it leaks gas.

When all the pieces have been taken apart, it is not a bad plan to count them so that when they are to be assembled, none will be missing. With the miscellaneous lot of stuff around a plating shop, this plan will frequently insure that none will be lost.

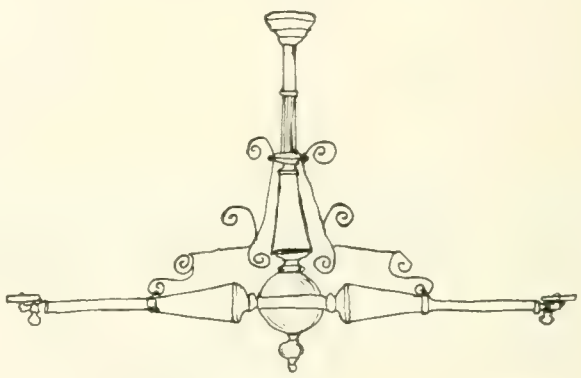


Fig. 2. Rough Sketch Necessary in Assembling the Chandelier after Refinishing.

Removing the Lacquer and Dirt

Before anything can be done in the way of re-finishing the chandelier, the lacquer, dirt and other foreign matter must be removed. To do this it is necessary to soak the parts in a strong, hot solution of either caustic potash or caustic soda. Make the following solution, if one is not already in use:

Water ..... 1 gallon
Caustic Potash or Soda .... 1 lb.

Use this solution hot and immerse the chandelier parts in it for 10 or 15 minutes until the lacquer is removed and the dirt has become softened. When this has been done take each piece and scrub it with a stiff bristle brush (after rinsing the piece in water) in order to loosen the dirt that is present in the crevices. Then rinse in cold water and dry.

It will then be found that the metal is clean but somewhat stained on account of the action of the strong potash solution on the brass. It will usually have a reddish shade, but this will do no harm as it is impossible to remove the lacquer and dirt without causing this discoloration.

Dipping the Chandelier Pieces

No matter what finish is to be afterwards placed on the chandelier, the surface of the metal must be clean, and for this reason it should be run through a bright, acid dip (unless, of course, the metal is iron or a lead

alloy when special treatment is necessary) in order to give a clean base metal to work on. The dip is made up as follows:

Sulphuric Acid	2 gallons
Nitric Acid	1 gallon
Common Salt	1 oz.

Run the pieces through this dip, rinse in cold water, then in hot water and dry. The surface will now be found clean and bright but more or less pitted .from the fly-specks It is surprising how deep the specks penetrate.

After the pieces have been dipped they are ready for the next operation of buffing.

Buffing

If the parts are not badly pitted from the fly-specks, the buffing may often be omitted, but this is not usually the case. As generally found, the brass, after dipping, will be so badly pitted that to attempt to leave it in this condition would be useless. The only method, therefore, is to cut down the surface previous to the final finishing.

The surface is cut down on a rag buff with tripoli in the manner usually followed in preparing brass for buffing. If an "Old Brass" finish is to be used on the chandelier, then coloring with rouge after cutting down with tripoli is unnecessary, but if other finishes are to be used it is frequently necessary to buff to a color with rouge or other buffing compound. The plater will have to suit himself in this respect and he can easily ascertain what to do. After buffing, the usual cleaning preparatory to plating or oxidizing is necessary and the chandelier is then ready for the finishing. Whatever finish is used (and this point depends upon the customer and the character of the article) the subsequent treatment is the same.

Lacquering

The durability of a chandelier always depends upon the lacquering and nothing is to be gained by doing a poor job or using a cheap lacquer. The best method of lacquering is to do it before assembling the chandelier as it is then possible to handle the pieces to a better advantage than it would be when the whole chandelier is lacquered. Dip lacquering, too, may also be used which is not only cheaper to carry out but is more certain than brushing as every part will be covered. Dip lacquering, however, is usually difficult to carry out in the ordinary jobbing shop on large or long pieces as the necessary volume of lacquer is not had. Brushing, therefore, will have to be used in such cases. The use of a lacquer spray is excellent and is really the best for the purpose as it not only insures a heavy coating (what is needed for the protection of the chandelier when in use) but is easily and cheaply applied. It may also be used with excellent results after the chandelier is assembled. In lacquering a chandelier

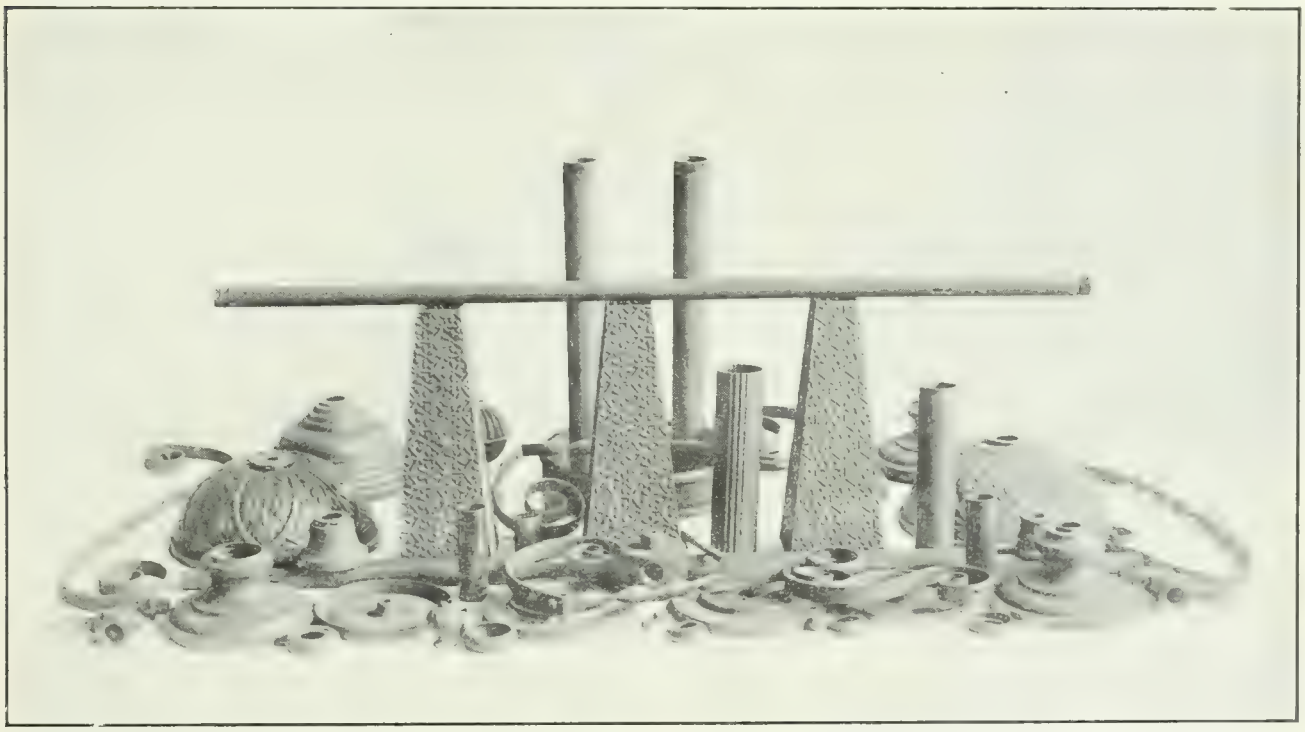


Fig. 3. The Various Parts of the Chandelier Showing 63 Separate Pieces.

after it has been assembled, there is one thing that must be borne in mind, and that is the fact that the handling that is necessary in putting the pieces together usually covers them with more or less grease or oil from the hands and this prevents the lacquer from adhering properly. It is advisable, therefore, to lacquer the various pieces before putting together.

The lacquer to be used will depend upon the character of the finish and nothing can be said along this line further than to obtain a lacquer that is suited for the work.

Assembling

In assembling the chandelier, put a small quantity of a paste, made of boiled linseed oil and red lead, on the pipe joints to make them tight and then put the various parts in the positions shown by the sketch first made. It will be found that when the parts are on the skeleton iron-pipe frame, and the gas-cocks and couplings at the ends are screwed up tight, every portion will be tight. Ornaments are put on with small screws and care must be taken not to lose them or it will be found difficult to replace them. If any of the ornaments are bent, as they frequently are, it will be necessary to straighten them. In other words, the plater will be obliged to combine in himself, the functions of a plater, gas-fitter and brass worker. The matter does not require much experience, however, as far as the gas-fitting and brass working are concerned, and a good plater will usually find no trouble in carrying out the necessary work.

The Gas Cocks

A word about the gas-cocks on the ends of the chandelier is necessary. When they are taken off, do not take out the key. Leave it in through all the operations even up to the final lacquering. The object is to prevent the attacking of the ground surface of the key by the various dips and solutions that the parts are passed through during the many operations. If this were not done, the surface of the key would be attacked so that a tight joint could not be obtained in the final fitting. By leaving it in, however, there is no trouble experienced in the various operations and the ground joint so necessary in making the cock gas tight is not disturbed.

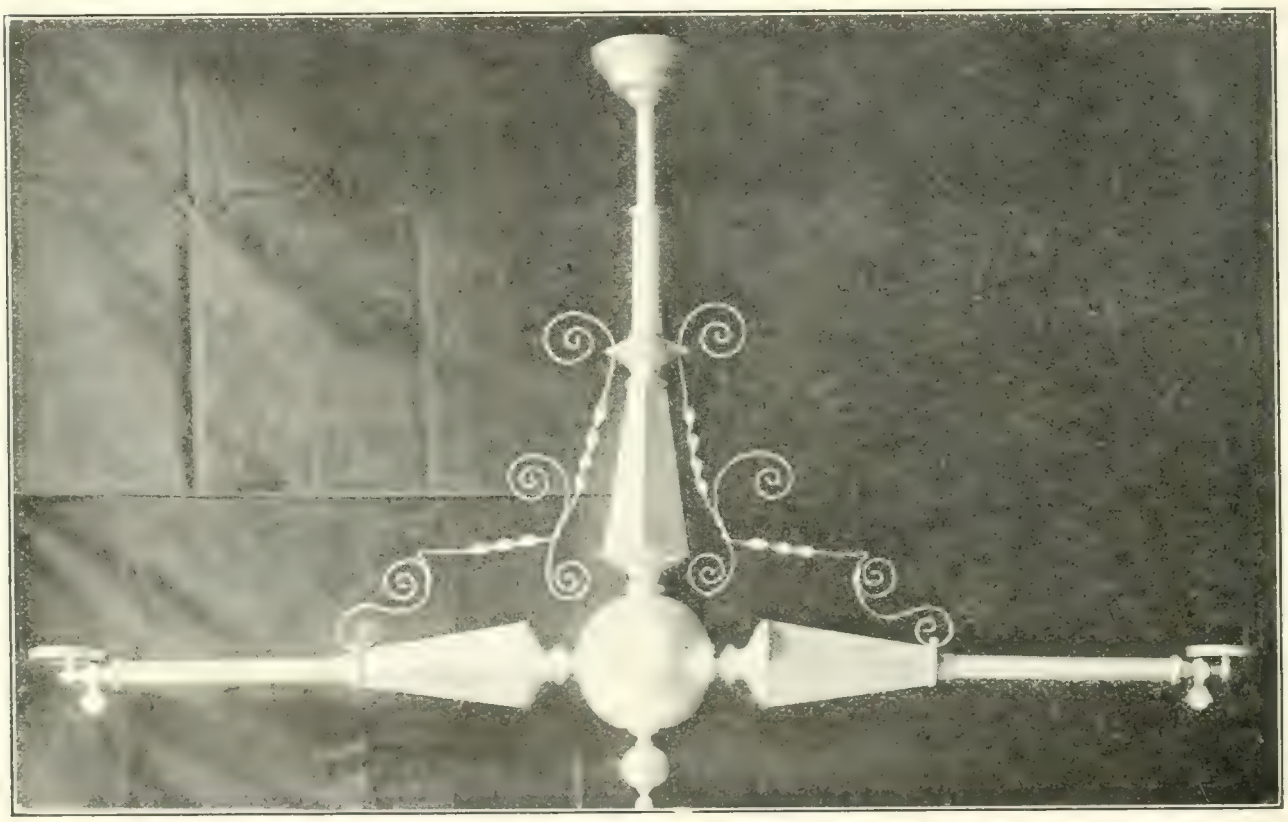


Fig. 4. The Assembled and Finished Chandelier.

When the chandelier has been completed and assembled, take out the keys and apply a small quantity of grease to them so that they will turn readily. If this is not done, the customer is apt to think that a good job has not been done. When a chandelier is brought to a plater to be "refinished" it is usually expected that not only will the refinishing be done, but it must be "put in order."

Conclusion

Now and then old chandeliers are found that are made of zinc, both in cast form and spun sheet shapes. When such is the case, care must be taken in cleaning them in the potash solution, otherwise the metal will be attacked. Such chandeliers are quite difficult to refinish as the zinc requires copper or brass plating after cleaning, and if badly pitted, it usually will hardly pay. The chandelier, as made within the past five years, is almost exclusively composed of brass, with occasionally white metal ornaments, and is readily refinished.

The Effect of Copper on Silver Plating Solutions.

All silver plating solutions contain more or less copper, depending upon the length of time they have been in use. When newly made, the amount of copper is quite small, but as they become old, the quantity increases. Copper enters the solution in several ways: First, all commercial silver anodes contain more or less copper. Second, a certain quantity of the "striking solution" is carried over with the work when transferred from one solution to the other. Again, copper hooks may be used, drippings from the brass rods on the tank fall into the solution, and other accidental causes, such as the dropping of wire or work in the bottom of the tank, may bring the condition about. The entrance of copper in silver plating solutions is so positive as time elapses that it is not infrequent to find quite a considerable quantity in a bath that has been in use for some time.

The question has often arisen about the effect of such copper contamination on the quality of the silver deposit, and also as to whether it is not possible to plate with an alloy of silver and copper instead of with pure silver.

In the *Transactions of the Faraday Society*, July, 1910, Samuel Field has given the results of his experiments upon the effect of copper on a silver plating solution. The matter was carefully gone over and exhaustive experiments carried on.

The solution used for the experiments was the regular cyanide silver solution employed exclusively for silver plating. The amount of silver in it was about 3 oz. per gallon (25 grams of silver per litre was used) and both the silver and copper were used as the cyanides. These cyanides were dissolved in potassium cyanide to make the plating solution.

The fact that silver and copper are so close in the electro-chemical scale led the author to believe that copper would deposit with the silver, and varying amounts of copper in the plating solution were, therefore tried. Varying quantities of free cyanide were also used. Amounts ranging from 1 to 4 oz. of free cyanide per gallon (approximately) were tried. The results obtained were as follows:

1. When the silver in the plating solution exceeds that of the copper, practically no copper deposits with the silver.

2. In order to deposit copper with the silver, it is necessary to have the quantity of copper exceed that of the silver at least 20 times. Such a condition, of course, is never realized in practice.

3. Free cyanide serves to prevent the deposition of copper along with the silver.

It was found that to continuously deposit copper with the silver in a silver plating solution is quite a difficult matter and cannot be controlled unless constant attention is paid to the proportions of copper and silver in it. In order to accomplish it, the solution must be dilute and contain at least 20 times as much copper as silver. The silver deposited must also be replaced as rapidly as deposited in order to preserve the balance of the solution.

Conclusions

The general conclusions reached were that with the quantity of copper that is ever present in a silver plating solution, practically none is ever deposited with the silver. The general belief that the simultaneous deposition of a small quantity of copper along with the silver produces a pinkish tint on the electrodeposited silver is, therefore, erroneous. *It was accordingly assumed that the presence of a small quantity of copper in a silver plating solution is not injurious at all as it does not deposit.*

A company has begun the mining of a radium mineral deposit in South Australia and a state radium bank is to be formed for controlling the radium produced from the ore. Banks in London and Paris are now in operation for a similar purpose for controlling the radium produced in England and France.

Japanese and Chinese Lacquers.

According to a Japanese periodical, both the Chinese and Japanese lacquers are obtained from the juice of a tree indigenous to China and which in early times was introduced into Japan.

Chinese Lacquer: The tree, which is abundant in Central China, grows wild and is cultivated at altitudes of 3000 to 7500 feet, the owners of the land claiming the varnish produced by it. The tree is tapped in June or early July, and the exuding grayish-white juice collected in shells, bamboo tubes, etc., and protected from oxidation by being covered with oiled paper. The tapping is repeated seven times at intervals of about seven days, and the tree is then left from 5 to 7 years to recover. In addition to that used locally, large quantities of the varnish are exported, principally to Japan. Adulteration of the varnish with tung-oil is of frequent occurrence. In 1908, 2,479,792 lbs. of the varnish at a value of about $725,000 were exported.

Japanese Lacquer: The lacquer tree grows abundantly all over Japan and is cultivated largely in the districts north of Tokio. The tree is usually tapped when 10 years old, the process being renewed at intervals from June to October. Each collector taps from 600 to 800 large trees or 1000 small trees during the season, the amount of crude varnish yielded by each tree ranging from 27 to 54 grams. As a rule the tree is left for future yield of varnish, but in some cases it is cut down and the branches made into bundles, soaked for 10 to 20 days in water, and then tapped by spiral incisions in the bark. The varnish thus obtained is of inferior quality, and is used for ground work and cheap articles. The raw varnish, known as *kiurushi,* is packed in wooden tubs, and is protected from oxidation by layers of oiled paper. Before use it is strained from particles of dirt, bark, etc., and allowed to stand in wooden tubs, when the inferior quality sinks to the bottom, leaving the thinner and finer qualities on the surface, whence they are decanted. The varnish is pressed through cotton or hemp cloths and is then ready for use as a priming or ground work.

Finer qualities are prepared by exposing the better grades of raw varnish, in shallow wooden pans, to the action of the sun or gently heating and stirring them over a fire. This causes the varnish to become dark brown in color and of the consistency of syrup. The product thus obtained is used for finishing, over coats of colored lacquer. Addition of pigments is made during the stirring and exposure to the sun, the best black lacquer being obtained by the introduction of an iron salt. Cheaper black lacquers consist of an inferior grade of raw lacquer mixed with the drying oil from perilla seeds. The so-called "pear ground" lacquer, which is used with gold dust, is obtained by the addition of gamboge, while an inferior one is prepared by the addition of perilla oil, plum juice or the yellow extract of the fruit of *Gardenia florida.*

Red lacquers contain cinnabar or red oxide of iron, and yellow contain orpiment. Brown preparations are made by mixing red and black lacquers, while green lacquers are obtained by adding indigo to the yellow product. Various metallic powders, and frequently charcoal are also incorporated with the lacquers.

The lacquer hardens only in a moist atmosphere and remains "tacky" when exposed to sunlight or heat. In drying, there is an absorption of 57.5% of oxygen. The only method of thinning employed is by the addition of camphor. In preparing lacquered ware, the prepared wood is coated with successive layers of the inferior lacquer mixed with pottery dust or clay powder and rice paste, and after each coat has hardened in a moist chamber, it is rubbed down with sandstone until a smooth, dull, grayish-black surface is obtained, after which the article is decorated and finished with the colored lacquers.

In working brass plating solutions, the formation of several colors on the deposit is caused by the absence of too little free cyanide. The introduction of more cyanide into the solution will usually overcome it.

The use of aluminum and zinc alloys for making castings for automobiles has now become quite small and only for parts which are insignificant. The tendency of the aluminum and zinc alloys to crack when cast in sand, and also to crystallize in service has brought this about and they are considered dangerous.

The "Washburne" Clay Riser Lining.

In making sand castings, the object of a riser is to compensate for the shrinkage of the casting itself on certain portions. The more a metal or alloy shrinks in cooling, the more necessary they are. The full value of risers is being appreciated more and more each year, and the constantly increasing use of strong bronzes, such as manganese-bronze, aluminum-bronze, etc., has brought about a need for a better understanding of the subject. In making gray-iron castings, risers are rarely necessary on account of the small amount of shrinkage of the metal in cooling; and if they are actually used, in the majority of instances they can hardly be called risers, but are more of the nature of vents than anything else. An iron molder rarely understands anything about the use of risers, and set him at the task of making a mold for casting manganese-bronze and he will usually utterly fail on this account.

When strong metals (and this always means metals which shrink excessively) first began to be cast, on account of the lack of knowledge of the use of risers, many failures resulted and founders now fail for this same reason. It is not saying too much to venture the remark that a proper understanding of the placing of risers on a casting means success, and when the subject is not well understood failure almost invariably follows. The riser may be called the secret of the art of casting strong metals.

To demonstrate the necessity of risers in casting the so-called strong metals, let a ball, say 4 inches in diameter, be cast of manganese-bronze and without a riser. If the gate has been sufficiently long, and the metal poured at the right temperature, the casting will have a good appearance and probably will show no shrinkage on the surface. Now cut the ball in half with a hack-saw and a large shrink-hole will probably be found in the middle. The hole is produced by the shrinkage of the metal in cooling. The outside of the ball, cooling first, draws from the interior leaving a cavity, or, perhaps, the gate draws from the casting so that by the action of both agencies, the shrink-hole is formed. Now if a riser is placed on the top of the ball that is sufficiently large to remain liquid after the ball has cooled, it will draw from the riser and thus feed itself. The gate, being the smallest in volume, of course, cools first and draws from the ball casting, and this, in turn begins to cool and draws from the riser.

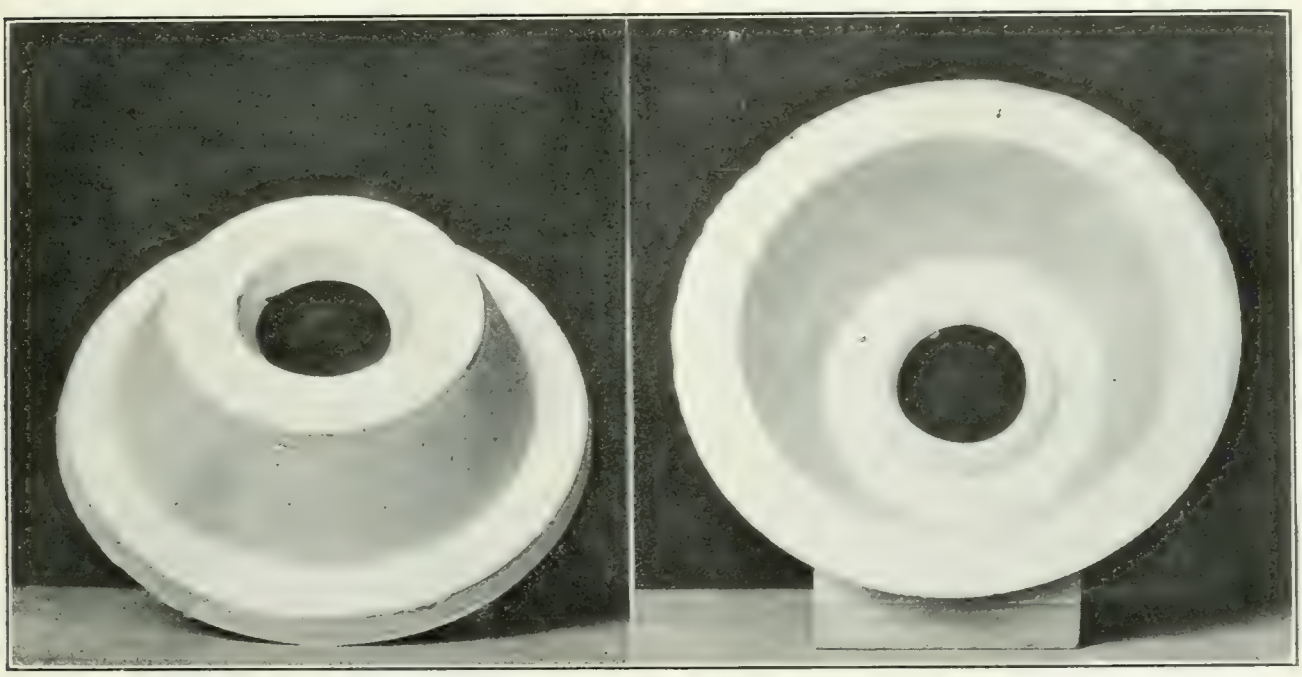


Fig. 1. Top and Bottom of the Clay Riser Lining.

The making of a riser on a casting is one matter, to place it in the right position is another, and to make it the right size and shape is still another. Unless a riser is sufficiently large to remain liquid while the casting is cooling it will be of no value. Indeed,

it may do actual harm if too small or not of the right shape, as it will draw from the casting leaving a shrink hole, instead of feeding it. The shape of a riser is of great importance. While the body of the riser may be of sufficient size to remain liquid while the casting is

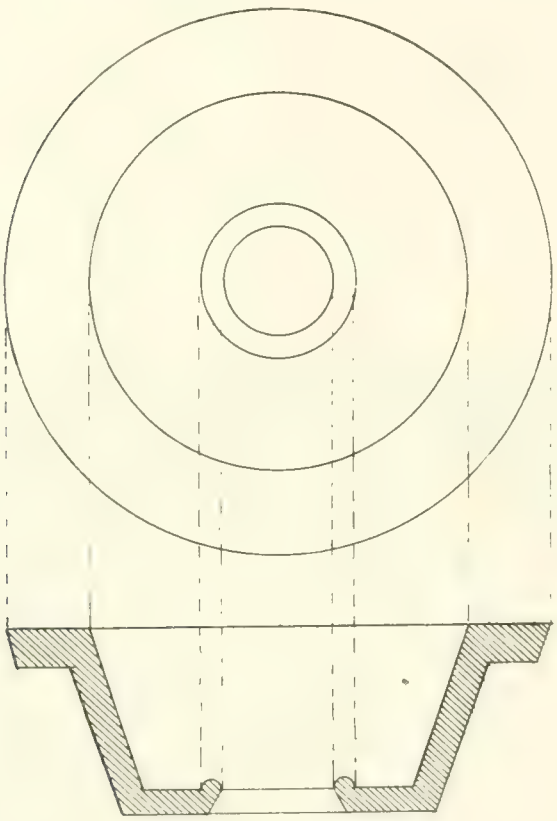


Fig. 2. Sketch Showing the Construction of the Clay Riser Lining.

cooling, if the neck, which joins it to the casting is too small or too long so that it cools before the casting cools, the riser cannot feed the casting and hence is valueless.

The use of the Washburn clay riser lining is one of the marked improvements in the art of casting metals. This riser lining is intended for making the risers on any kind of casting, whether of sand or chill, that may be desired. It is the invention of Edwin C. Washburn of Minneapolis, Minn., who is now placing it upon the market and upon which he was granted a patent a number of years ago.

The riser lining consists of a clay form similar in shape to a flower-pot, but somewhat shorter. The smallest size made is shown in Fig. 1 and the cross section and plan of it in Fig. 2. The hole in the bottom, it will be noticed, is made of such a shape that if the riser breaks from the casting in cooling (as it frequently does), the break will not be in the casting itself.

The riser lining has been made so that it can be set directly upon the casting itself. This manner of setting it is shown in Fig. 3. The base of the lining sets directly upon the casting and the top is at the top of the cope. Its use, therefore, is quite simple and requires no extra knowledge on the part of the molder than would be necessary in cutting a gate.

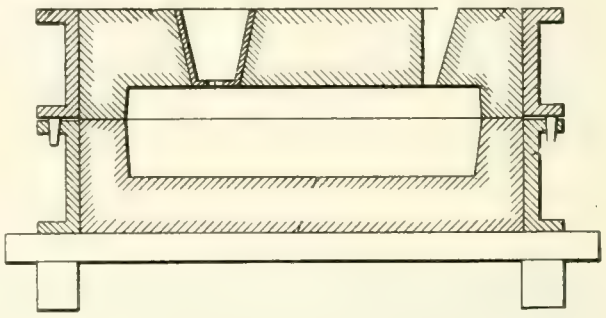


Fig. 3 How the Riser Lining is Used.

The riser linings are made in a number of different sizes so as to accommodate large or small castings. The largest size is 12 inches in diameter at the base. In the use of these linings, it is essential that the base shall be slightly larger than the part of the casting it is to feed. In this manner a riser of sufficient

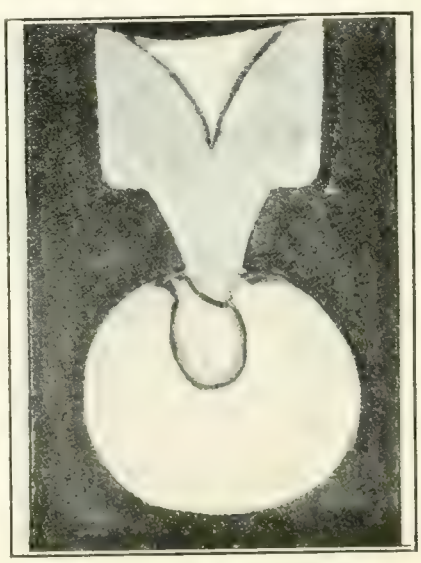


Fig. 4. Shrink-Hole in a Casting Caused by the Use of too Long a Neck on the Riser.

size is obtained. When the casting cools, if the riser is not broken by its own shrinkage at the base, it is readily removed by a hammer or by sawing. As the clay linings are cheap, the fact that they can be used but once is of no importance.

The value of the clay riser linings in casting metals lies in the following:

1. The matter of using the right size of riser on a casting and designing it properly is

taken from the hands of the molder, in case such a proceeding is desired. The superintendent of the foundry, or foreman may assume the responsibility and give the molder the desired size of lining. Uncertainty is thus eliminated.

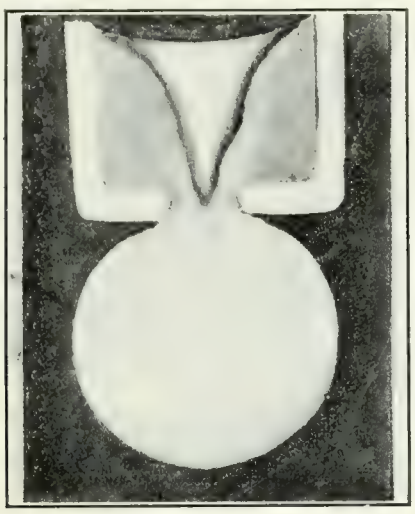


Fig. 5. Showing the Effect of the Clay Riser Lining in Producing a Solid Casting.

2. The risers on a large number of castings of the same character will always be the same. When the risers are made in the ordinary manner it is rare that they are twice alike. The loss of castings from risers poorly made is then reduced to a minimum.

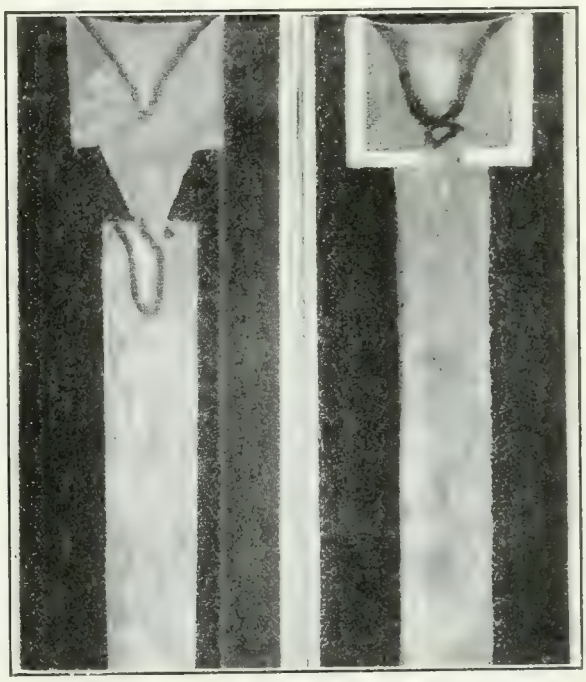
3. The clay of the lining being dry, it does not chill the metal like a green sand mold and, therefore, the metal in it will remain liquid longer than in the ordinary green sand portion of the mold.

4. The neck of the riser is theoretically correct so that it will not cool before the riser itself.

5. In case a riser is to be "churned" as it frequently is when a small riser is to feed a large casting and is prevented from cooling, the clay lining is admirably adapted, as it is not injured by being hit by the iron rod used for churning.

In the use of risers, as previously mentioned, the design is of the utmost importance, and unless attention is paid to the neck, they will frequently be useless. Take, for example, a spherical casting shown in Fig. 4 and upon which a riser with a long neck is used. The neck of the riser, on account of its length, cools before the casting and then draws from it. The riser then cools and shrinks as shown. The drawing of the neck from the casting, while cooling, results in the formation of a shrink-hole as illustrated. When the clay riser lining is used as shown in Fig. 5 the neck is so short that it does not cool. It is also surrounded by the non-conducting clay which likewise prevents its cooling. The casting as it cools, therefore, draws from the riser in the proper manner and there is then no shrink hole in it.

Another example of the use of a long neck is shown in the case of a billet or rod shown in Fig. 6. In this case the neck cools before the casting and draws from it producing the shrink hole as shown. In Fig. 7 the manner of using the clay lining is shown. The riser then feeds the casting as it should and there is no shrink-hole formed.



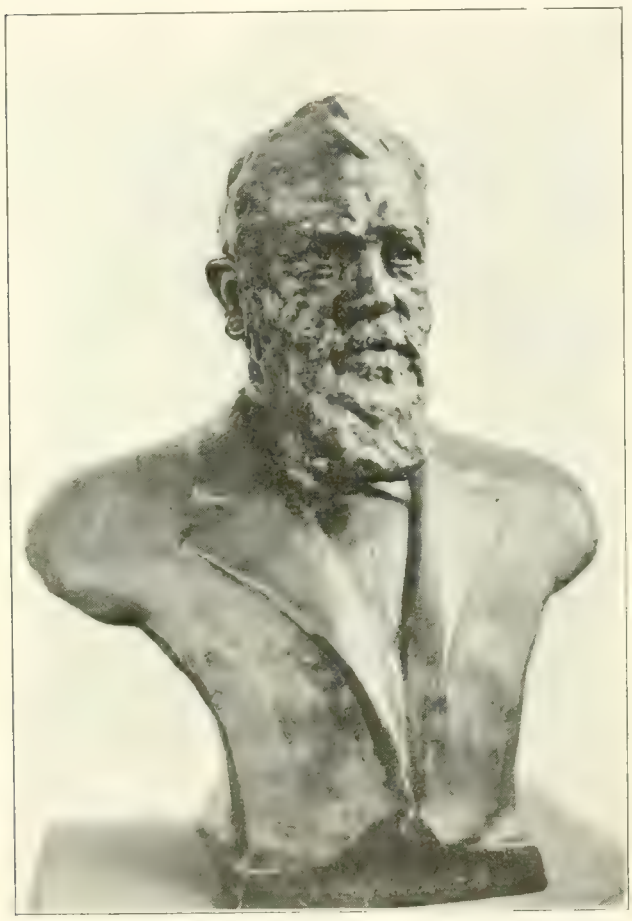
Figs. 6 & 7. Showing Effect of a Long Neck on a Billet Casting and the Advantage of the Riser Lining.

The clay riser linings will be found particularly adapted in casting manganese-bronze as the use of suitable risers is imperative, otherwise good castings cannot be made.

One of the uses of vanadium is in dyeing and very durable blacks are obtained by using it with analine colors. It is also used for an indelible writing ink. As a coloring material for pottery it is also used, and when fired at a high red heat is said to give a gold color with a greenish shade. According to an authority, the entire supply of vanadium for dyeing in France is obtained from slags produced from the blast furnaces of the Creusot Steel Works and amounts to about 165,000 lbs. per year.

A Metallized Plaster Bust.

The possibilities in the metallizing or electroplating of plaster of Paris are shown by the accompanying reproduction of a photograph of a plaster bust that was recently metallized by Prof. L. G. Delamothe, the well known specialist in the art of metallizing non-metallic substances. Prof. Delamothe is now located in Santa Rosa, Cal., and is engaged in the work of metallizing the flower and fruit specialties of the Luther Burbank establishment.



Plaster of Paris Bust Metallized by Prof. L. G. Delamothe.

The plaster of Paris bust, herewith shown, is that of James B. Merritt, the past master of Oakland Masonic Lodge No. 188 and who donated the fund for building the Masonic Cathedral in Oakland, Cal. The bust was modeled by Gertrude Boyle Kunno who has also completed one of Luther Burbank. This bust will also be metallized by Prof. Delamothe.

The metallized bust herewith shown is 2 feet in width and 2½ feet high, and is the largest article that Prof. Delamothe has yet metallized. In addition to this class of work, he is negotiating with the builders of fine arts building of the coming Panama Exposition, to metallize all the interior work.

The price charged for metallizing the bust herewith shown was $35.00. The daily papers state that the work has been very satisfactory to the parties interested in it.

Light Magnesium and Aluminum Alloys.

The use of an alloy of magnesium and aluminum for various purposes has been patented by G. Pistor and Paul Rakowicz of the Chemische Fabrik Griesheim Electron of Frankfort-on-the-Main, Germany, the well known manufacturers of metallic magnesium and other commodities, (U. S. Patent 965,485, July 26, 1910).

The alloy mentioned as the best consists of the following:

Magnesium	92%
Aluminum	8%

It is stated that this alloy has a specific gravity of only 1.75 and is equal in strength to gun-metal. The other alloys of magnesium and aluminum in which the magnesium is present in excess is claimed.

It is claimed that this patent does not conflict with the "magnalium" alloys as they contain aluminum in excess and magnesium as the minor constituent.

The lightness of the magnesium and aluminum alloys, together with the fact that they can be cast and worked like brass, the inventors say, opens a great field for them.

Electrolytic Zinc Refining.

According to V. Engelhardt and M. Huth in *Metallurgie,* the electrolytic refining of zinc is unprofitable. While the electrolytic refining of copper yields a profit on account of the gold and silver that are obtained as a by-products none are obtained in the refining of zinc. At the Friederich-hütte works the refining of the zinc from the residue, obtained in the well known zinc-desilverization process, was tried electrolytically, but was not a success. Neither was the Hoepfner process of the electrolysis of zinc chloride economical. The most economical, however, is the sulphate process, but the use of an insoluble anode is one of the objections as carbon is disintegrated.

Alloys of Nickel and Cobalt with Chromium.*

By Elwood Haynes.†

The metals nickel and cobalt have always possessed a peculiar interest for the chemist. Like nearly all of the more recently discovered metals, their compounds were known before the metals themselves were discovered. Indeed, it has been known for centuries that certain substances were capable of giving a blue color to glass, and there is but little doubt that this peculiar power was due to some crude compound of cobalt.

About two centuries ago, the ores of cobalt and nickel were encountered in the mining of copper. It was at first supposed that they were ores of the latter metal, but the miners, after vainly striving to smelt the ore, and failing to obtain any copper from it, designated it as "Kupfernick", and from this expression, the word "Nickel" originated.

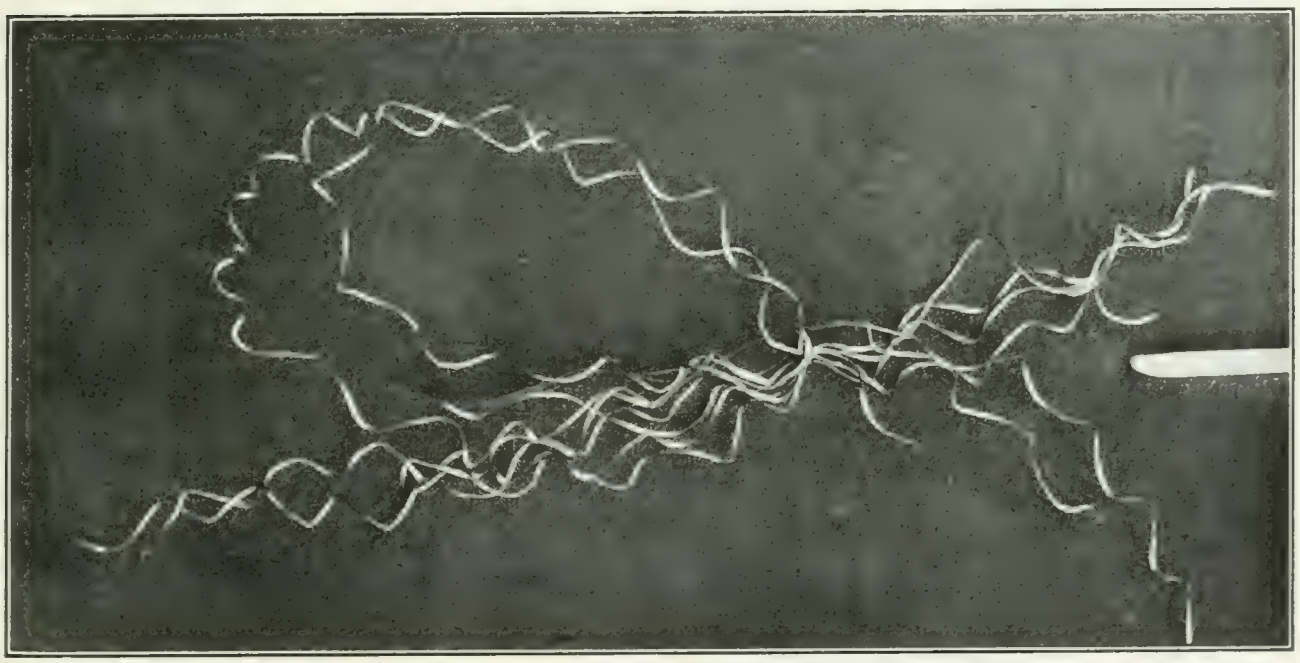


Fig. 1. Chips from a Steel Bar Made by Cutting it on a Lathe with a Tool Made of a Cobalt and Chromium Alloy at a Speed of 200 feet per Minute.

Attempts were also made to smelt the ores of cobalt, but, as no useful metal resulted, they decided that the goblin, or "Kobold", supposed to inhabit the mines, had placed a ban upon the ore, and thus rendered it incapable of producing valuable metal. From this designation by the German miners, the name "Cobalt" was derived.

It was not until 1751, that Cronsted published the results of an investigation which he had made upon an ore obtained from the mines of Helsingland. This ore yielded a brittle metal, and as it occurred most abundantly in "Kupfernickel", he suggested for it the name of Nickel.

A few years later, in 1776, it was discovered that nickel was evidently one of the constituents of a Chinese alloy, known as "Packfong".

The use of nickel in German silver began about the year 1823. It was not, however, until 1857, that Messrs. Deville and Debray, the celebrated French chemists and metallurgists, prepared pure nickel by heating its oxalate in a lime crucible. From the pure metal thus obtained, wires were made, which showed a tensile strength superior to that of wrought iron. The wires also showed considerable toughness, and when polished, presented a bright, silvery appearance, and retained their luster for an indefinite period, under all ordinary atmospheric conditions.

A few years later, the art of electroplating nickel was discovered, and has since received a very wide application. Tons of the double sulphate of nickel and ammonia are used for this purpose every year.

Besides this latter important application of the metal, it is now used in large quantities for the manufacture of nickel steel, which

*A paper read before the American Chemical Society at San Francisco on July 16th, 1910.

†The Haynes Automobile Co., Kokomo, Ind.

may become a common substance in the making of naval guns, projectiles, armor plate and high-class automobiles.

The history of cobalt is similar to that of nickel, except that the *compounds* of cobalt were used in the arts, instead of the metal, itself. In fact, but little was known of the metal until 1857, when Deville produced the pure metal in practically the same manner that nickel was prepared. It was found that cobalt was even stronger than nickel, possessing a tensile strength of about 65,000 pounds per square inch. Indeed, up to that time, it was the strongest pure metal yet discovered, and it still holds this position, with the possible exception of tantalum.

About the year 1895, I made a number of tentative experiments, relating to the production of alloys of nickel with iron, chromium, and other metals. The fusions were made in small graphite crucibles, which were heated in a blast furnace of the Fletcher type, operated by natural gas. I had at that time, the advantage of natural gas at a pressure of forty pounds or more per square inch. With a suitably arranged furnace of this character, temperatures ranging up to the fusing point of the most refractory Missouri fire clay, were readily obtained. I succeeded in obtaining by this means, alloys of nickel and chromium, which contained, however, a considerable amount of carbon and silicon. A small quantity of aluminum was sometimes added to the alloy, in order to improve its quality. By this means, I obtained an alloy of chromium, nickel, and aluminum, which was hard and brittle, but possessed fairly good color and luster. From this alloy a knife blade was formed, which showed fair cutting qualities, and considerable resistance to atmospheric conditions. It was readily soluble in nitric acid, and after long exposures to the atmosphere of a chemical laboratory, it became tarnished showing a greenish coating on its surface.

Later, I attempted to produce alloys of nickel and chromium with titanium, by means of an electric furnace, made from blocks of quick lime. This proved unsatisfactory, but I continued experimenting with the gas furnace, and finally succeeded in producing an alloy of nickel and chromium entirely free from carbon, by heating the pure mixed oxides of the two metals, with powdered aluminum, in a crucible lined with pure oxide of aluminum. The reaction was so violent that most of the metal was thrown from the crucible. A few small pellets were saved, and these showed great malleability, flattening readily under the hammer, without cracking. The alloy possessed a fine color, and when polished, exhibited a beautiful luster. Larger pellets were soon obtained, and it was found that when the chromium content much exceeded ten per-cent, that the alloy showed remarkable resistance to chemical reagents, particularly to nitric acid.

At about the same time, I reduced a mixture of the sesquioxides of cobalt and chromium, with powdered aluminum, and thus obtained minute pellets of an alloy of cobalt and chromium. The little particles thus produced were not much larger than pinheads. They were found to be remarkably hard, and could scarcely be scratched by a file. A few of them were ground off on one side by means of carborundum, and showed a brilliant luster. It occurred to me that the metal might become serviceable for cutting instruments.

A short time after the above experiments were made, I was called actively into the automobile business, and thus compelled to abandon further experiments along this line for some time.

In 1905, I repeated some of the former experiments, with a view to utilizing the alloys of cobalt and nickel with chromium, for ignition points, in connection with gas engines. I was soon able to produce both the alloys of nickel and cobalt in considerable quantity, I ascertained that the nickel-chromium alloy could be worked cold, while the cobalt-chromium alloy must be worked hot in order to obtain any degree of satisfaction.

The first pellets of the cobalt-chromium alloy, weighing from fifteen to thirty grams, were obtained by heating mixtures of aluminum with the oxides of cobalt and chromium, in crucibles lined with the oxide of aluminum. Some of these pellets were heated to redness, and flattened out under the hammer, and while this could be done without cracking the alloy, the metal was found to be very hard, even at red heat.

I soon found that it was impracticable to reduce the alloy in this manner in large quantities. I accordingly purchased a considerable amount of pure cobalt and pure chromium, and had a mixture of nearly equal parts of these metals fused in an electric furnace, the metals being placed in a carbon crucible lined with pure magnesia. The alloy was cast into a small bar, about one-fourth of an inch

square, and five or six inches long. This alloy exhibited most of the characteristics of that obtained by reduction with aluminum, but it could not be drawn to any extent under the hammer without cracking. Whether this was due to the high percentage of chromium, or to slight impurities in the metals employed, I am as yet unable to say.

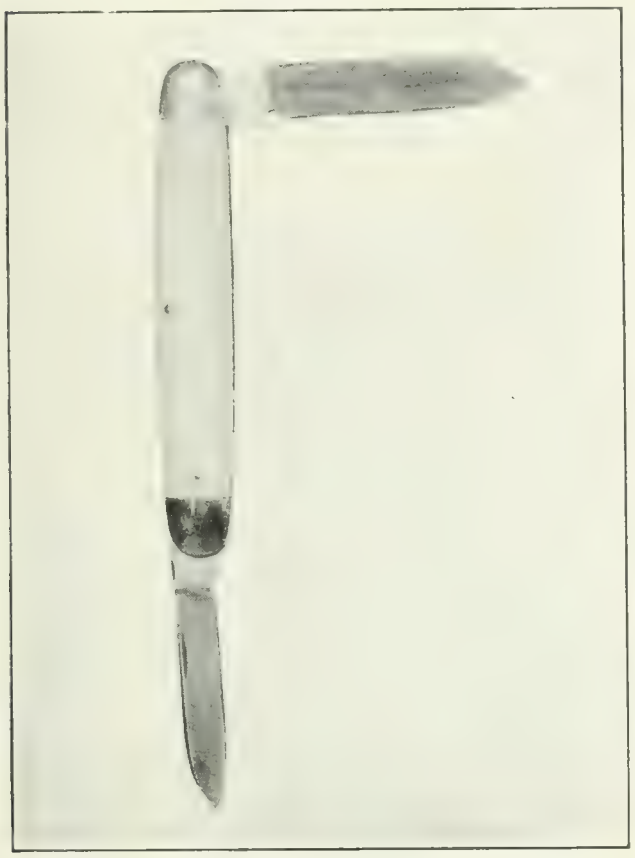


Fig. 2. Knife Made of an Alloy of Cobalt and Chromium.

In order to determine what the effect of alloying the cobalt with a smaller percentage of chromium would be, I again had recourse to the gas furnace, and succeeded in melting a mixture containing 75% cobalt, and 25% chromium, in a crucible made of a very refractory material, which I compounded for the purpose. Much to my satisfaction, I succeeded in melting this alloy to a perfect fluid, and poured it into an ingot mold, which gave me a bar of metal about one-half an inch square, and five or six inches in length. This metal proved to be very sonorous and elastic, and if some care were used, it could be hammered out into a rough strip.

After a considerable amount of experimenting, with various purifying agents, I finally succeeded in producing a very tough and malleable alloy, which could be hammered out into the thinnest sheet at a bright red heat, without showing signs of cracking. A razor blade was made from a bar of this alloy, and while it did not prove equal to the best steel for this purpose, it has been used hundreds of times for shaving purposes, and after a year and a half, shows practically no signs of wear, though of course, it has been necessary to strop it frequently, in order to keep it in good condition. This bar was made about two years ago, and I am sure that I have since produced metal that would be much more satisfactory for the purpose.

A test of tensile strength and elastic limit of this material was made, with results as follows: Elastic limit, 79000 lbs. Tensile strength 96000 lbs., and Elongation 3%. It will be seen from the above that both the

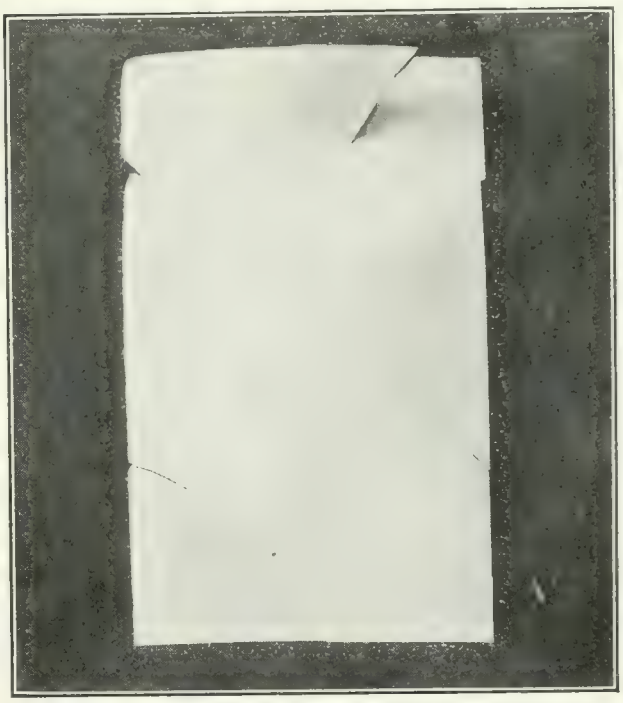


Fig. 3. Paper Cut with Knife Shown in Fig. 2 Indicating How Sharp an Edge it Will Take.

elastic limit and tensile strength of this material are superior to those of untreated steel, resembling more nearly those of good nickel steel. The elongation is quite low, but this is to be expected, on account of the great hardness of the alloy, which is equal to that of mild tempered tool steel. This is a very significant fact, since heretofore, it has not been possible, so far as I am aware, to form an alloy of non-ferrous metals, which would show a modulus of elasticity comparable to that of iron and steel. And it is lack of this valuable property in various non-ferrous mixtures, which renders them inferior to iron for many important purposes.

A pocket knife blade and several table knife blades were made from this material, and were found to be very satisfactory in every respect. One of these table knife blades has now been in use for more than two years in the kitchen, where it was used for all sorts of purposes, such as cutting bread, turning griddle cakes, peeling and paring vegetables, and for various other purposes, such as are known only to the culinary art. After this use and abuse, the knife shows not the slightest trace of tarnish, and has held its luster so well that when exposed to the sun, it shows a reflection which dazzles the eyes.

By mixing the alloy with small quantities of other substances, its properties may be modified to a remarkable degree. By this means, I have obtained alloys, or combinations, which, while very brittle, would readily scratch quartz crystal.

By reducing the quantity of chromium to some extent, and adding certain other materials, alloys which are practically proof against nitric acid can readily be obtained, which are sufficiently soft and malleable to be worked cold, having a hardness not much greater than that of mild, untempered steel.

Between these two extremes, a great variety of combinations can be made, which are suitable for use for various purposes. For example, I have produced an alloy of sufficient hardness that when it is formed into a small bar, say one-half an inch wide, one-fourth an inch thick, and three inches long, and one of the ends shaped for a cold chisel, a 20-penny nail can be cut in two without marring the edge of the chisel in the slightest degree. I have formed another alloy into a small lathe tool, about one-fourth an inch square, and three inches long, which showed cutting qualities comparable to high speed tool steel. In fact, in some respects, especially under high speed and light cuts, it has stood the test for a long time, where high speed steel failed almost instantly, on account of the intense heat generated. I wish it distinctly understood, however, that I do not recommend this material as yet, for lathe tools, though it would have a high value for this purpose, if it were not obliged to compete with alloy steels.

An alloy of 75% cobalt and 25% chromium, to which small quantities of other metals are added, is not only sufficiently hard for good edge tools, but is quite tough, and can be bent much beyond its elastic limit without cracking; resembling in this respect the alloy steels, but, generally speaking, it is much harder. A bar of the alloy, one-fourth inch square, can be bent cold at right angles, without showing any signs of cracking.

Chemical Properties

When the mixture of cobalt and chromium is heated to whiteness in a crucible, the cobalt first commences to fuse, and immediately begins to combine with the chromium, and if the metals are mixed in the proportion of about three parts, by weight, of cobalt to one of chromium, a eutectic is formed which seems to possess a lower melting point than either cobalt or chromium. This is all the more remarkable because the melting point of pure, carbonless chromium is exceedingly high.

The color of the alloy lies between that of steel and silver, and is especially pleasing in bright light. The alloy is also readily polished, but requires special treatment in order to develop its highest luster.

The most remarkable property of this combination, however, is its resistance to corrosion. It is equalled in this respect only by gold and the metals of the platinum group. It is attacked slowly by dilute hydrochloric acid, and somewhat vigorously by the strong acid, especially when heated. Momentary exposure, however, to either dilute or strong hydrochloric acid, has practically no effect on the metal. Both strong and dilute sulphuric acid attack it very slowly when cold, and not very rapidly even when heated. Nitric acid is totally without action upon it, and a polished piece of the alloy may be boiled in that substance for hours, without affecting the luster of the metal in the slightest degree.

Solutions of the caustic alkalies are also totally without action upon it, even when boiled for hours. The alloy is likewise proof against all atmospheric influences, whether the air be moist or dry, and retains its brilliant luster for months or even years, under severest conditions. Even sulphuretted hydrogen, when present in the atmosphere in large quantity,is totally without action upon it.

Its resistance to culinary operations has already been mentioned.

When the metal is heated in contact with the atmosphere, it retains its color up to a temperature approaching a dull red, or about 500 degrees, Centigrade, when it shows a faint straw color, which deepens as the temperature rises, passing through bronze-yellow, purple, blue, and finally terminating in blue-black.

The alloy does not scale, even when heated to bright orange, and the film of oxide does not seem to increase in thickness after prolonged heating.

It can readily be melted in an open crucible in a gas furnace, with practically no oxidation, so long as a slightly reducing flame is maintained. This is all the more remarkable, on account of its high melting point, which seems to be about 1650° C., for the 25% alloy. Indeed, the metal has been melted in this manner with a loss of less than one-half of one per cent.

Uses

The uses for any substance may be limited in several particulars; first, by the limitations of its fitness, second, by the possibility of producing it in proper form, and third, by its cost. This material is particularly suitable for all kinds of small cutting instruments, since it takes an edge comparable to that of tempered steel. It is especially adaptable to the manufacture of pocket knives, on account of the beauty of its color, and the brilliancy of its luster, both of which remain permanent under all circumstances, thus giving the blades a particularly attractive appearance. Knives of this description may be used for cutting fruit, without danger of marring their luster in the slightest degree.

Alloys in certain proportions will also doubtless find a wide use for surgical instruments, since they resist perfectly all sterilizing solutions.

The alloy is perhaps better adapted for table cutlery than anything that has ever yet been produced. We all know too well that a silver plated knife, for example, is ill adapted for cutting meat, and it cannot be sharpened without destroying the plating. Steel knives, on the other hand, while they cut well, require endless labor to keep them in presentable condition, and at best, they are unsightly in appearance.

The alloy is also of considerable interest to the chemist and physicist. It is admirably adapted for the manufacture of fine weights for balances, scrapers, spatulas, and other laboratory appliances. To the physicist, it furnishes a material which is at once hard, lustrous and untarnishable, and hence well adapted for the manufacture of fine weights, measuring instruments, and various small tools.

The alloy is also particularly well adapted for the manufacture of standard weights and measures, such as the gram, kilogram, meter, etc., and it is difficult to see in what respect it is inferior for this purpose to the expensive platinum-iridium alloys now in use.

The alloy could readily be made into laboratory vessels, cooking utensils, spoons, forks, etc., and it is limited in this respect only by its cost.

Cost

Regarding the cost of production and manufacture, I am not at present prepared to make definite statements. I have succeeded, however, not only in obtaining the raw material at lower prices, but have also reduced the cost of production to a considerable degree, so that it is now possible to produce the alloys with as much despatch and precision, as is possible in the production of common alloys.

In conclusion, I wish to add that the chemist seldom receives much credit or pecuniary reward for the discoveries which he is constantly wresting from Nature, and handing down to the engineer and manufacturer. Even the inventor usually receives more credit for his work than the scientist or discoverer, who often furnishes him with the facts and materials which render his invention possible.

New Aluminum Solder.

A new aluminum solder has recently been patented by Joseph Silver of New York City, (U. S. Patent 968,203, Aug. 23, 1910). It consists of the following:

Tin	85.10%
Aluminum	10.80%
Magnesium	2.75%
Cadmium	1.35%

The mixture is made in a graphite crucible and stirred with a dry stick of wood, after which it is poured into bars. A flux of borax is used to cover the metal while melting. For some classes of articles the inventor states that platinum may be used instead of cadmium, and that such an alloy is preferable although of high price.

At the works of Wm. Cooke & Co., of Sheffield, England, the largest wire-rod mill in that country was recently started. By the use of this new mill, a 200 lb. steel billet can be rolled into a wire rod in a minute and a third.

New Books.

A PATHFINDER. By Edward G. Acheson. Published by the Press Scrap Book Co., 203 Broadway, N. Y.

This book is an autobiography of the author and has been written in an exceptionally pleasing and interesting style. As well known, Mr. Acheson is one of the foremost scientists and inventors of the day, and the world owes much to him. Carborundum and artificial graphite are his leading inventions and his work has been mostly in the line of electric furnace products.

Mr. Acheson was born in Washington, Pa., in March, 1856, and was early identified with the iron industry of the Western Pennsylvania section. As early as 1873 he took out a patent for a new process of mining coal, ore or clay. At this time he was seventeen years old and then began his first experiments in electricity. In describing this first introduction to electrical science he says: "I bought a number of cheap yellow metal watches. Fitting up galvanic batteries, I secured a number of my mother's silver forks and with them as anodes, silver plated the watch cases, and sold them at an increased price. When my mother's effects were divided among her children, my 'anodes' were properly deducted from my allotment."

He describes his connection with the railroad business in an interesting manner and in his twenty-second year, he became identified with the United Pipe Lines Co., a sub-company of the Standard Oil Company. Having compiled a table that proved of great value in gauging the oil tanks of the company and showing the quantity of oil in them, he incurred the displeasure of the superintendent, who promptly discharged him. He brought the matter before Daniel O'Day, then the manager of the pipe lines, who investigated the case and removed the superintendent. Mr. Acheson would probably have been made superintendent had he been of a mature age.

A number of chapters of the book are devoted to his connection with Edison at Menlo Park, N, J., and which seemed to be the actual beginning of his electrical career. After spending some time in Edison's laboratory, he was sent to Europe to represent the Edison Company at the Paris Exposition and continued to represent them after the close. He severed his connection with them, however, and became identified with the installation of lighting plants in portions of the Continent. He installed electric lights in the Scala Theatre in Milan, Italy, and in a number of other places.

The description of his attempt, in connection with John S. Huyler, the chocolate manufacturer, to place a new anti-induction telephone wire on the market is quite interesting. The full details of his invention of carborundum and his "ups and downs" with the Carborundum Company are given and cannot fail to interest those who are familiar with the subject.

Mr. Acheson is now living at Lundy's Lane, near Niagara Falls, Canada, where he has an extensive estate. The book which he calls "The Pathfinder" is compiled and bound in the most elaborate style and contains 143 pages. It is the finest example of the art of bookmaking that it is possible to produce. The frontispiece is an excellent steel-engraving of the author.

A New Electrogalvanizing Solution.

A new solution for electrogalvanizing has recently been patented by Edward F. Kern of Knoxville, Tenn. (U. S. Patent 967,200, Aug. 16, 1910). It consists of the following:

Water	1 gallon
Zinc Fluo-silicate	1 lb.
Aluminum Fluo-silicate	12 oz.
Grape Sugar	12 oz.
Ammonium Fluoride	8 oz.

While the zinc fluo-silicate may be used alone for the solution, it was found by the inventor that a coherent and adherent zinc deposit of an excellent nature can be obtained by the use of a fluo-silicate of metal that stands higher than zinc in the solution pressure series. This is obtained by the use of aluminum fluo-silicate. It was also found that the addition of grape sugar improves the appearance of the zinc deposit.

The addition of ammonium fluoride is made to prevent the separation of gelatinous silica in the solution. Percy S. Brown of the Western Electric Co., of New York City is interested in the process and is a part owner of the patent.

The "Soss" Pressure Casting Machine.

The manufacture of castings by the so-called pressure process has made rapid progress within the past few years and large quantities of such castings are now daily turned out in a number of establishments. The advantage of this method lies in the fact that they can be cast to the exact size desired and no machining need be done upon them. It will readily be appreciated, therefore, that many castings can be produced at a fraction of the cost of the ordinary machined article.

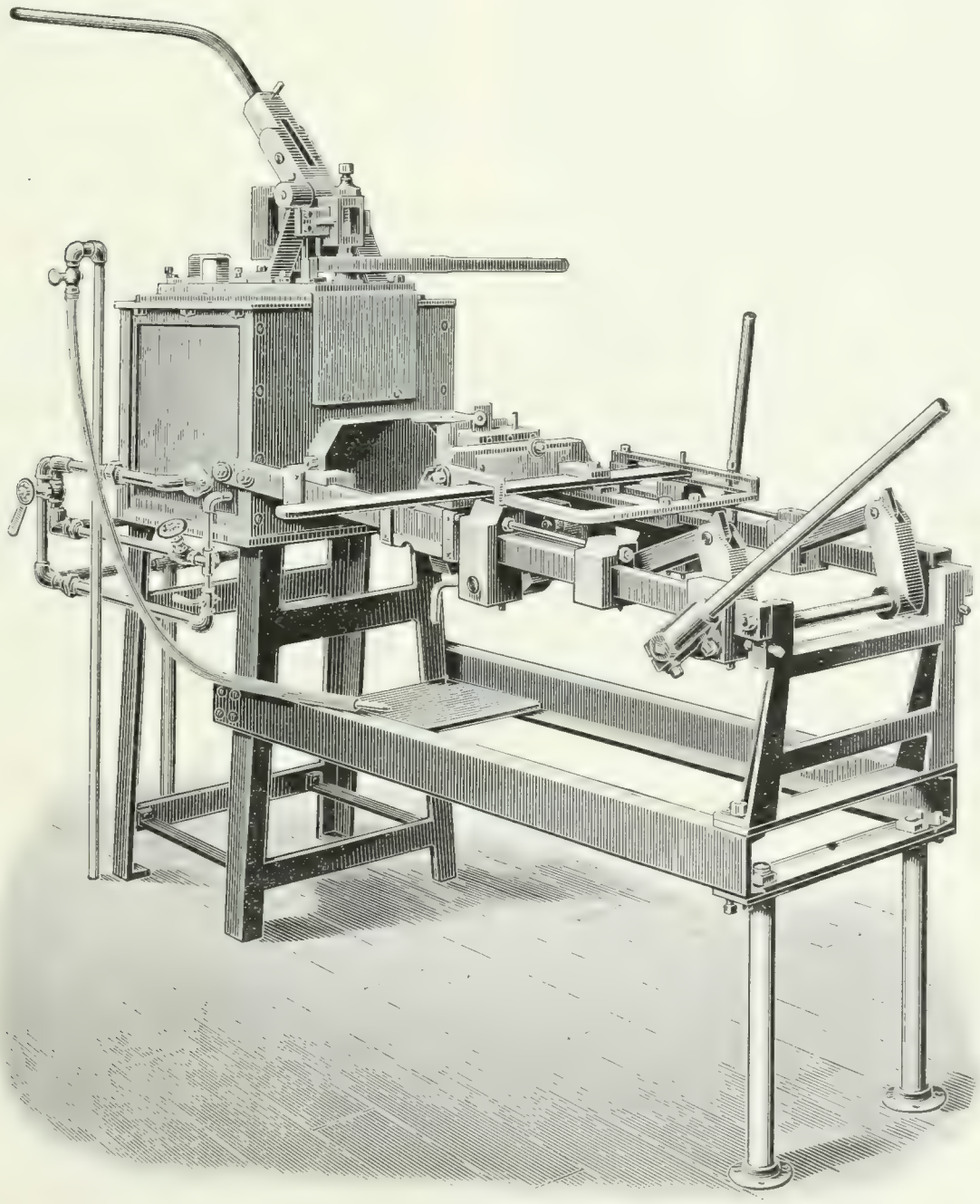


Fig. 1. The Soss Die Casting Machine Used for Making Castings Under Pressure.

While the manufacture of castings by the pressure process dates back for a number of years, the method of making them has been considered a trade secret, and manufacturers have sold only the finished castings and would not allow even the machines upon which they were made to be seen. It has remained for the Soss Mfg. Co., 435 Atlantic Ave., Brooklyn, N. Y., to design and patent a machine for the production of die castings that can be purchased by any who may desire to produce their own die castings.

The Soss Mfg. Co., first constructed the machine for the manufacture of their invisible hinges that have created so much interest. These hinges are shown in Fig. 2. They are cast on the machine. Many other castings were also made on the machine and it was finally decided to place it upon the market for sale. It is now in use in a number of establishments for making die castings.

The construction of a die casting machine involves much accurate and ingenious machinery in order to have it work properly. In the Soss Machine the metal is forced into the mold from the bottom, either by means of a hand lever or by power, so that clean metal is

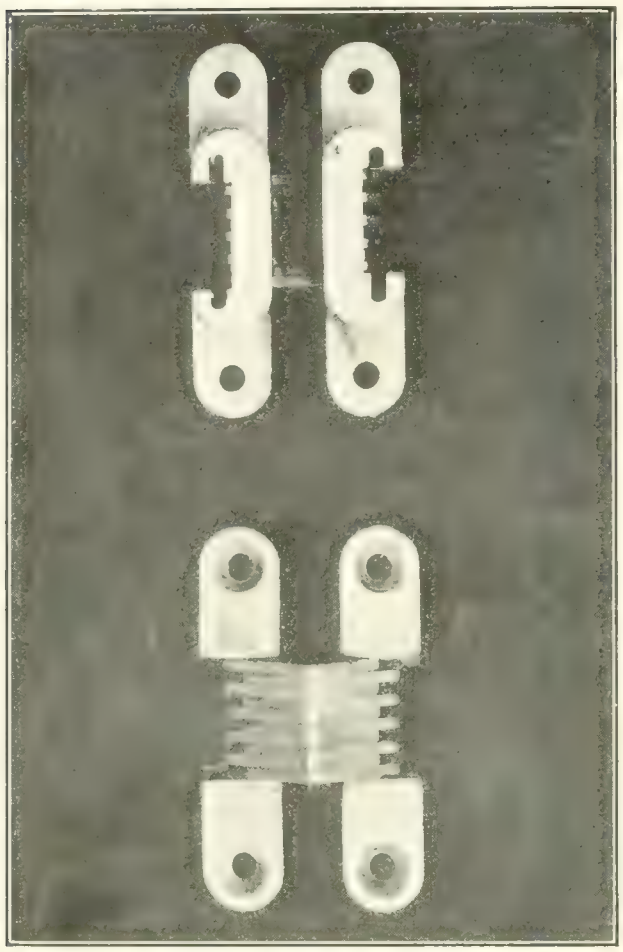


Fig. 2. Castings Made Under Pressure on the Soss Die Casting Machine.

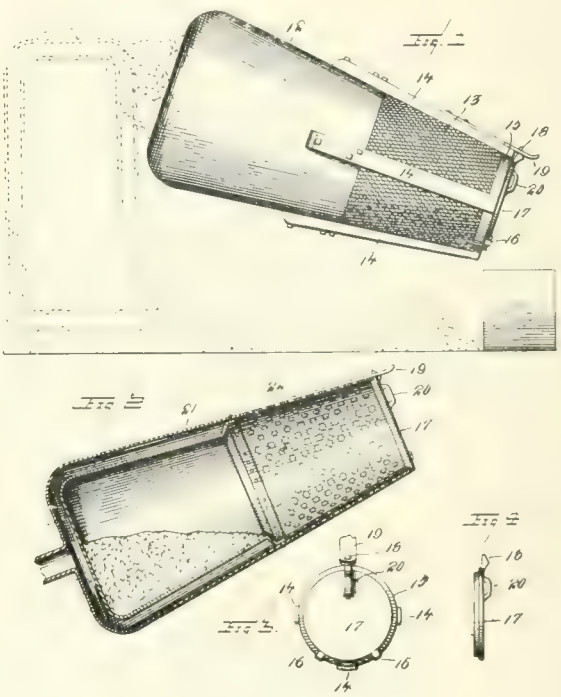
always obtained. The mold, which is always made of steel so as to obtain the smoothest and hardest surface, is forced up to the nozzle, through which the metal flows from the melting pot, by means of levers and held there until the metal has filled the mold. It is then brought back and the cores removed by other levers (the cores are of steel). The casting can then be removed from the mold.

The machine as now made by the Soss Mfg. Co., is shown in Fig. 1 and the metal is melted by gas. A very large variety of castings may be made in it, and in order to do so it is only necessary to make new molds for each piece. The machine itself remains the same. By the use of the machine with two men to operate it, it has been found possible, in one establishment to turn out 4000 pieces of a small casting where 30 men were formerly employed in casting them by hand. In addition, castings of a superior nature are obtained by the pressure casting employed on the machine.

A New Form of Tumbling Barrel.

A new form of tumbling barrel of the oblique type has recently been patented by Hubert M. Greist of the Greist Mfg. Co., of New Haven, Conn., manufacturers of sewing machine attachments (U. S. Patent 965,813, July 26, 1910).

The barrel is herewith illustrated and in form it is of the oblique type so that it may readily be tilted for dumping the finished work. The barrel can be jacketed so that steam may be used for drying or heating it, or it may be used without the jacket if de-



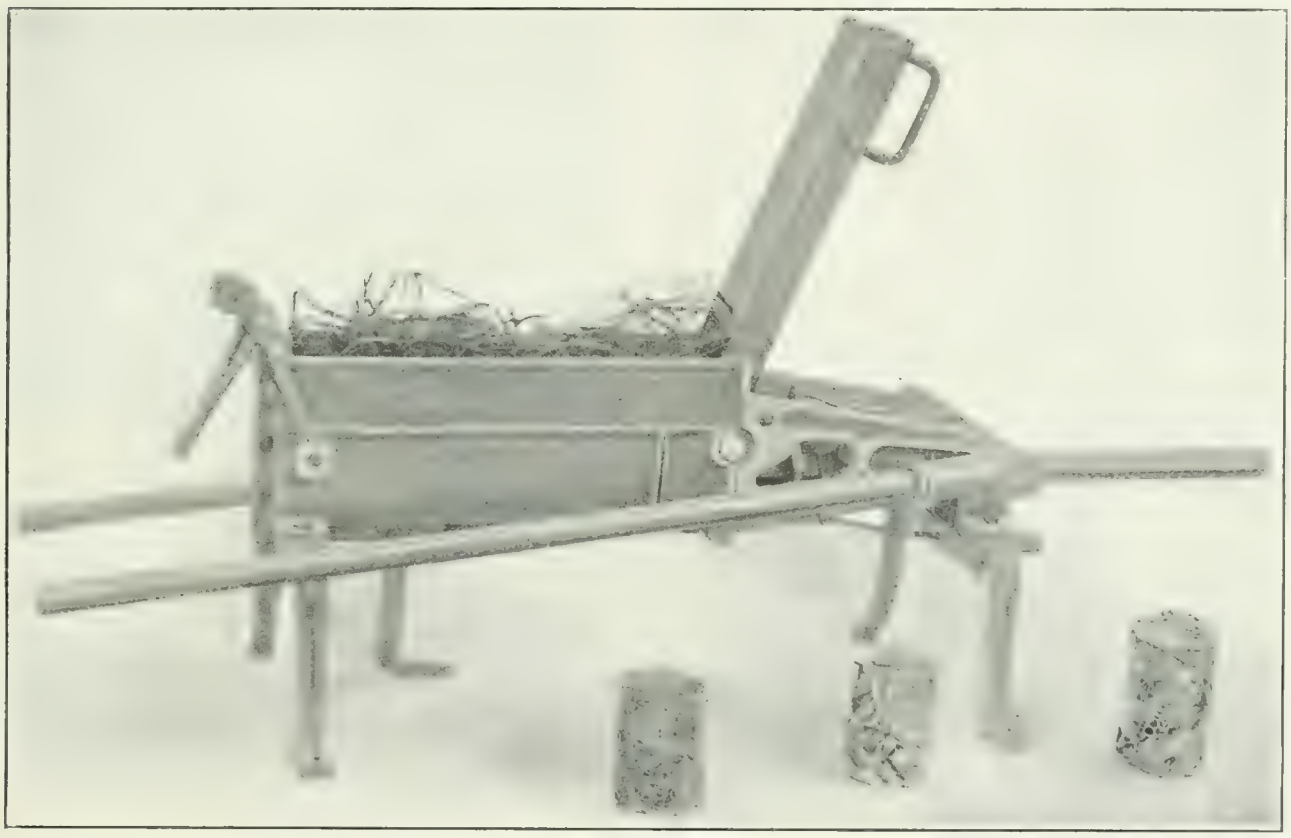
sired. The essential feature, however, lies in the use of a perforated end as shown. The object of this is to allow the work, after tumbling, to be sifted while being dumped so that clean articles are obtained. Articles that are tumbled with sand, sawdust, leather, etc., may, therefore, be completely freed from them before being dumped. The end of the barrel is provided with a cover which is placed on it and the tilting done. When the work passes to the perforated part the fine material sifts out through the perforations. The cover is then removed and the barrel is dumped. The barrel, therefore, is capable of performing two operations.

The "Champion" Hand Cabbaging Machine.

A new and useful machine for cabbaging all kinds of scrap metals by hand has recently been placed on the market by the Famous Mfg. Co., of East Chicago, Ind. The machine is herewith illustrated. It is intended for use by brass founders, scrap metal dealers and manufacturers who have bulky scrap to handle.

To operate it, the top is raised and the rammer drawn back when the pressing trough is ready for filling. When filled, the cover is pressed down two or three times in order to compress the scrap so that the cam lock can be engaged (this is readily done by hand) when the roller cam lever is thrown over and the top locked. The lever is then worked up and down by one or two persons which forces the scrap into a compact mass. The top is then raised, and the ram drawn back and by means of foot pressure on the lever the cabbage is lifted up so that it can be grasped with the hands and removed. The time that is taken is quite small and cabbages can be made with considerable rapidity.

The machine is very strongly made, with tool steel parts where hardness and strength are necessary in order to prevent wear. For use in cabbaging scrap copper and brass wire, skeleton sheet scrap of all kinds and other bulky material, the machine will be found very useful. Brass founders and scrap metal dealers will find it a cheap and satisfactory appliance for their work. It is well known that, not only is the waste of brass and copper scrap less when melted in the form of cabbages, but the quality of the metal obtained is superior. There is also less labor in feeding the scrap into the crucible. Brass rolling mills and other large establishments now cabbage all of their bulky scrap with hydraulic machines, and the hand cabbaging machine herewith shown will perform the same operation and produce cabbaged metal ready for the crucible.



The "Champion" Hand-Cabbaging Machine for Brass Foundry and Scrap Metal Dealers Use.

Brass founders who find that their castings contain pin-holes and are using phosphorus in it, will discover that the use of too much of this substance (or its equivalent, phosphor-copper or phosphor-tin) may be the cause. When a mixture contains zinc, as nearly all brass foundry mixtures do, the amount of phosphorus used must be very small. When no zinc is used, a far greater quantity of phosphorus can be used.

Black Backgrounds for Etched Brass Name Plates.

Etched brass name plates are a product of recent years and have succeeded in driving out the cast bronze or brass name plates to a great extent on account of their cheapness. They can be used, too, on account of their lightness, in many instances in which cast plates will not answer.

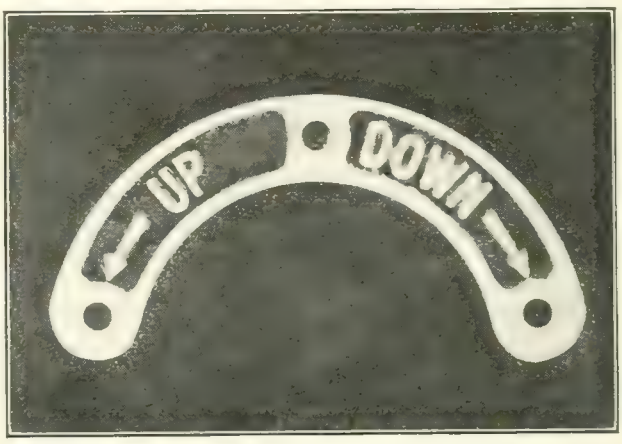
The ordinary etched brass name plate, as now made, is produced by coating a flat and polished sheet of brass with a thin layer of bichromated albumen, exposing to light for a few minutes under a glass negative upon which are a number of the desired name plate designs (it is equally as easy to print a number at once), then developing the brass plate which removes the albumen not exposed to the light (or that protected by the black portions of the negative) and leaves the brass free to be etched. The etching solution will not attack the parts protected by the albumen (or resist, as it is called). Another way is to transfer a design to the brass from a master-plate, or to use other materials, as for example, asphalt, for the resist. The ultimate effect in all cases is the same: The design on the plate is protected by the resist and the exposed brass is etched.

The etching is done by means of a solution of perchlorate of iron or by making the anode in an acid copper solution. When the required depth has been obtained, the sheet containing the number of name plates thus etched is washed, and, without removing the resist, treated in some manner to produce a black background. When this has been done, the resist is removed and the sheet cut up so as to produce the individual plates, after which each is lacquered and is then ready to send to the customer.

The success of the etched name plate industry depends upon the character of the background to quite an extent, as the bare brass will not look well, and an uneven or dirty color is quite unsatisfactory. The best effect is produced by a jet-black background of a uniform color.

Three methods are in regular use for producing a black background on etched brass name plates and which are herewith given. Whatever method is used, the preliminary operation of etching is the same. As the usual resist is attacked by alkalies, it is impossible to use regular cyanide solutions, such as those of copper or silver for plating or oxidizing the name plates, and the best results are obtained by the use of solutions that are neutral or slightly acid as acid, unless strong, does not attack the resist.

After the brass plate containing the name plates has been etched the resist is allowed to remain on. If the etched surface is tarnished, as it usually is after standing in the air after etching and drying, a solution made of 2 parts of water and 1 part of muriatic acid is flowed over the surface which will immediately remove any stains and leave the etched surface



Name Plate With Black Nickel Background.

clean and uniform. Rinse, but do *not* dry. Immediately begin the operation of producing the background. If allowed to dry, stains will again form. The methods in use for making the black background are as follows:

Black Nickel

The use of a black nickel deposit is the best method of producing a black color on the etched name plates. The solution does not affect any of the various kinds of resist used and a large number of plates can be treated in the tank at one time. The solution that is used is the well known black nickel bath and is made as follows:

Water	1 gallon
Double Nickel Salts	8 oz.
Ammonium Sulphocyanate	2 oz.
Zinc Sulphate	1 oz.

The solution is used cold with a weak current. The best results are obtained when a current of about 1 volt tension is used. If more is used, the deposit will be streaked and gray. It will also come gray if the solution is too weak. As soon as the deposit is black,

remove the plates, rinse, dry and cut up, after which immediately lacquer in order to prevent the brownish discoloration which forms on the surface of the deposit upon standing some time. As previously mentioned, black-nickel is the most satisfactory black background for the name plates. It can be used on any metal, whether yellow brass, copper, bronze, etc.

Oxidized Acid Copper Deposit

An excellent method of producing a black background is to first give the etched plate a deposit in an acid copper solution and then oxidize in liver of sulphur. The acid copper solution is made as follows:

Water	1 gallon
Copper Sulphate	2 lbs.
Sulphuric Acid	1 oz. (fluid)

The etched plate is allowed to remain in the solution until a good copper deposit is produced on the background. This takes from 15 to 20 minutes. Use a current with a tension of about 1 to 2 volts. The deposit is red and matt. Then remove, rinse and immediately oxidize in the following solution:

Water	1 gallon
Liver of Sulphur	2 oz.

Use this liver of sulphur solution cold and it will not act upon the resist. It is used as a dip and not with the current, of course. In a minute or two the desired color will be obtained. Then rinse and dry. The color is a good black and as the copper deposit is matt or dead, it is quite pleasing for many classes of work.

Ammonia Black

The ammonia black (so-called) is produced by oxidizing the name plates in a solution of copper carbonate in ammonia water. It is used as a dip, and it is not as easily done as the other methods previously mentioned. It must be done warm or hot in order to obtain a good color and this is apt to attack some resists; in fact, not all resists will stand it. To use this method the following solution is made up:

Water	1 gallon
Strong Ammonia Water	1 gallon
Copper Carbonate	an excess

By the word "excess' is meant that as much copper carbonate should be dissolved in the solution as can be taken up, and yet have a slight amount remain undissolved. Unless there is a slight amount undissolved, the dip will not work well. The solution then has a blue color with a green sediment in it.

In order to produce the black on the plates, they are dipped into it while warm. It has been found that while the solution will produce a color on the plates when cold, it is not uniform or black, but slightly brown, although it may be used for some classes of work. The solution will begin to work well when a temperature of about 120 degrees F. is obtained. It works better and more rapidly, of course when a higher temperature is employed and the best results are found when about 160 or 170 degrees F. are obtained in it. This heat, however, is apt to start the resist and a lower one is recommended. The dip is used in a stone crock surrounded with warm water.

A New Pyrophoric Cerium and Magnesium Alloy.

The so-called "rare earth" metals, when alloyed with certain other metals, possess the property of giving off sparks when scratched with hard substances, and, therefore, may be employed for ignition and illuminating purposes. Among the "rare earth" metals are cerium, lanthanum and didymium.

To produce a pyrophoric alloy, cerium and magnesium are alloyed in the proportion of about 85% of cerium and 15% of magnesium. It has also been found that when such an alloy is heated to a temperature of about 550° C. in a closed muffle and hydrogen gas passed in so that it is absorbed, the pyrophoric property of the alloy is greatly increased thereby.

The cerium-magnesium alloy is heated in a closed muffle and hydrogen gas passed in so long as any absorption can be detected. The metal is then allowed to cool down while the gas is passing. It has then completely changed its appearance and the original silver-gray fracture has been modified to a greenish-gray from the absorption of hydrogen and the formation of a hydride.

As it is difficult to prepare pure cerium, the mixture of this metal with the lanthanum and didymium, that accompany it, is used with good results. The alloy has been patented by Adolf Huber of Berlin, Germany.

The addition of 17 per-cent of aluminum to steel will render it non-magnetic.

Yields of Various Products of Crude Petroleum.

In an article on "The Waste of Our Fuel Resources", I. C. White, the well known geologist, makes the following remarks in regard to the yields of the various products of crude petroleum. When petroleum was first refined, kerosene, he says, was the most important product, and after it had been removed, the remaining product was thrown away. To-day, kerosene is less important and it is now considered that the naphtha products (gasoline, benzine and naphtha) are the most important. Where formerly everything except the kerosene obtained from petroleum was thrown away, now nothing is wasted. The following table shows the yields of the various products now obtained from crude petroleum:

Yields of Various Products from Petroleum

Kerosene	20.5%
Lubricating Oils and Greases	10.0%
Gas Oil	30.0%
Naphthas	15.0%
Paraffine Wax	1.5%
Roofing Pitch	2.5%
Paving Pitch and Road Oils	2.0%
Coke	3.0%
Fuel Oil	14.0%
Total	98.5%
Loss in Manufacturing	1.5%
Total	100.0%

The term *kerosene* includes all oils burned in lamps, in the household, in railroad trains, etc.

The lubricating oils include all the oils and greases used for lubricating, soap making and other purposes.

The term *naphtha* is used in a general sense and designates all the light products having a boiling point of 175° C. or under. Gasoline, benzine and ordinary naphtha come under this head and constitute, at the present time, the most important products of petroleum. Constant attempts are being made to increase the yield of these products from crude petroleum. The use of gasoline in automobiles, for power engines generally, for heating and cooking has brought about the desire to increase the yield to supply the ever increasing demand.

The gas oil is used to enrich water gas made by treating red hot coke with steam. An illuminating gas is thus produced. This process is now in extensive use in cities and has replaced, to a large extent, the process first used for making coal gas by heating coal in retorts.

The paraffine waxes are employed principally in candles, although many other important but smaller uses occur. Paraffine is used in conjunction with stearic acid in the manufacture of candles so that they will not soften when burned in a warm room. About 15,000 tons of such candles are used each year in the United States.

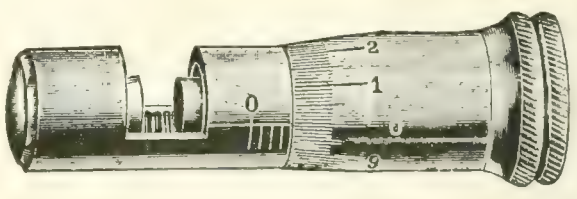
The roofing and paving pitches are used for coating paper, roofs and in road making. The use of petroleum products in road making is yet in its infancy and holds out much promise.

The coke resulting in petroleum refining is used in the manufacture of electric light carbons.

The fuel oil results after the other products have been removed and is used for fuel. In the United States, the greater portion of the oil used for fuel is this product, and as it is really a by-product, it is comparatively cheap. The use of oil for fuel is constantly increasing.

A German Micrometer.

The form of micrometer herewith illustrated is now extensively used in Germany and seems to present considerable advantage on



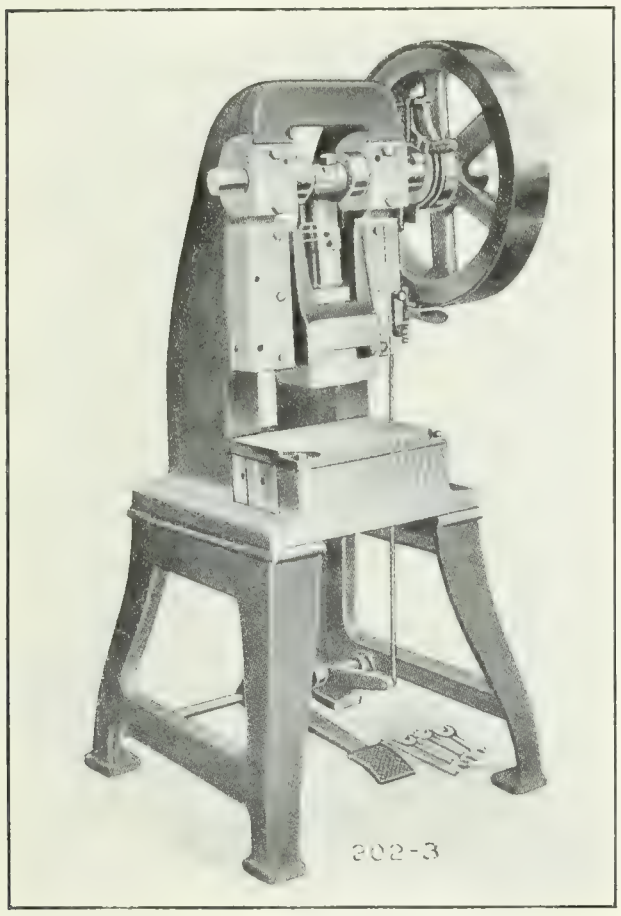
A Useful German Micrometer.

account of its compact shape. For measuring wire and small rods it is particularly useful as it does not have any overbalancing part like the ordinary micrometer. It is made by Paul Rückert of Gera, Germany.

According to a recent *Consular Report*, tantalum dental instruments are now finding uses in the dental trade as they are as hard as steel and do not rust. It is expected that they will supplant steel for this purpose to a large extent.

A New Pattern of "Baird" Press.

The Baird Machine Co., of Oakville, Conn., have recently placed on the market a new type and design of open-back press which has many excellent features. The heavy design is one of the most noticeable features and it has



New Pattern of "Baird" Press.

been constructed for doing heavy blanking and drawing of sheet metal goods. While the press shown is a plain one, there are several unique attachments that can be applied when desired. The press has a long slide, strong bearing support and heavy balance wheel. The hand lever and treadle are placed in a very handy position.

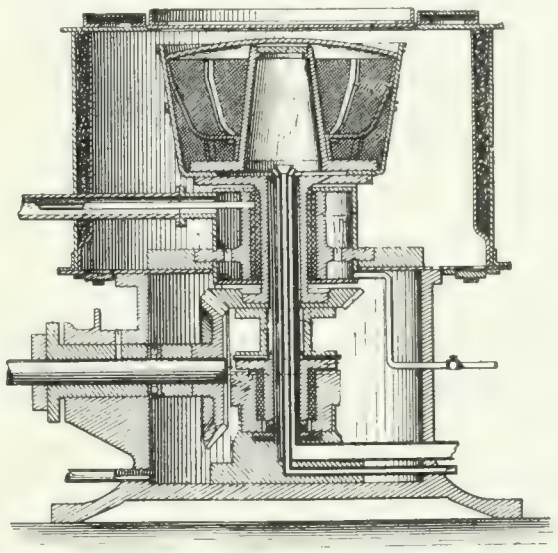
The shaft is extended on the left side so that the application of attachment is an easy matter. Back or side roll feed, transfer attachment or dial attachment can easily be placed on when purchased or applied by the user without the necessity of shipping back to the factory. The press is made in four sizes.

According to experiments recently made by an investigator, it has been found that pure cobalt is a much harder metal than pure nickel.

A Centrifugal Apparatus for Extracting Tin from Scrap.

A new form of centrifugal apparatus for the removal of tin from old tin cans and tin plate scrap has recently been devised and patented by Emerson C. Higgins of Bayonne, N. J. The apparatus is herewith illustrated.

To use the apparatus, the tin scrap is placed in the metal basket in the middle and provided with a false bottom. Gas is then passed into the apparatus and ignited and the basket revolved at about 650 revolutions per minute. Owing to the reducing action of the gas, the tin cannot become oxidized. The products of combustion pass out at the opening at the top of the apparatus.



Centrifugal Machine For Removing Tin from Tin Plate Scrap.

As the basket containing the tin scrap is revolved, the tin and solder on it are thrown off by centrifugal action and strike against the sides of the outside casing from which they may be removed through the openings in the bottom.

The principal impurities in commercial aluminum are iron, silicon, carbon and sodium. The iron and silicon, when present in any appreciable quantity, harden it and render it brittle. The effect of carbon is the same although rarely more than traces are found. Sodium is often present in considerable amounts, and while it does not affect the malleability in any degree, it causes the aluminum to corrode easily when exposed to the air and becomes covered with a white oxide. Some of the first samples of aluminum made contained sodium and for this reason corroded more readily than commercial aluminum now made.

Questions and Answers.

QUESTION No. 853. In taking a wax impression from metal in order to make an electrotype, we find that the beeswax, which is used for taking the impression, cracks. Is there anything that can be added to it to soften it?

Answer. An addition of Venice-turpentine will soften the beeswax. The usual addition is 1 part of Venice-turpentine to 10 parts of the wax but you may find less necessary.

QUESTION No. 854. We are putting some cheap iron hardware on the market and wish an inexpensive finish. Tinning, nickel plating, japanning, etc., are too expensive. Is there any cheaper finish that we can use?

Answer. The only suggestion that we can make is that of dip coppering. Tumble the castings bright and then dip into a solution of sulphate of copper made up as follows:

Water	1 gallon
Copper Sulphate	1 oz.
Sulphuric Acid	1 oz.

Dip the castings in it and the surface will immediately become coated with copper. As soon as the coating takes place, remove and rinse. Then dry and, if possible, lacquer as it will serve to protect the copper from tarnishing.

QUESTION No. 856. We are plating zinc piano-hinges with nickel. We first strike them in copper and then nickel them, afterwards buffing them. There seem to be marks on the surface that will not buff out. They are irregular shaped and the sample sent will indicate what they are. Can you inform us what causes them?

Answer. The spots seem to have been caused by imperfect rinsing or drying, and we should think that after you coppered them they were allowed to dry and stain, or were stained while wet. Run them through a weak muriatic acid pickle previous to nickeling and after coppering and this will clear the surface.

QUESTION No. 857. We have a customer who has been using genuine babbitt-metal on mine-cars, but he wishes something less expensive for the work although he must obtain equally as good results as regards wear. He has the idea that a less expensive metal will answer. We have in mind a mixture of lead 50 lbs.; tin 30 lbs.; antimony 20 lbs.; and copper 5 lbs. Will it answer?

Answer. You can use a cheaper mixture, we believe, with equally as good results. The mixture you mention contains too much copper. Try the following which is an excellent medium-priced mixture:

Lead	50 lbs.
Tin	35 lbs.
Antimony	15 lbs.

QUESTION No. 858. We manufacture a line of nickel plated spectacle and eyeglass frames and are receiving complaints that our goods after being in stock for some time, turn yellow. We know it is not caused by an insufficient coating of nickel, because washing the frames after they have become yellow, whitens them again. Can you suggest any remedy for this defect?

Answer. Your nickel solution, probably, on account of being old, has become contaminated with iron and it is deposited along with your nickel. All nickel anodes contain iron which does not all deposit with the nickel and gradually accumulates in the solution. The nickel deposit from such a solution always contains iron (frequently several per cent) so that when exposed to the air, the iron causes a slight film of rust to form. We suggest that you throw away your nickel solution and make up a new one as it is the only remedy.

QUESTION No. 859. In making manganese-bronze castings, is a high or long riser better than a short, heavy one? We have been informed that a high riser puts a pressure on the casting and closes any blowholes.

Answer. Unless the high riser is heavy (i. e. of large cross-section) it will cool or freeze before the casting has set and thus actually do harm by drawing from it. The object of a riser is to feed a casting and unless it remains liquid after the casting has chilled, it is of no value. A high riser is of advantage as it puts a pressure on the metal and serves to close blowholes. The best form of riser is one that is heavy and also high.

QUESTION No. 860. In electrogalvanizing, what is the object of adding sulphate of aluminum in small amounts?

Answer. The use of sulphate of aluminum in an electrogalvanizing solution is for the production of a bright and smooth deposit, Without it, the zinc deposit is apt to come rough and spongy.

QUESTION No. 861. What mixture with an aluminum base will give the greatest tensile strength with the lightest weight? Please give the proportions of the mixture?

Answer. Among the common alloys of aluminum, a mixture of 2 parts of aluminum and 1 part of zinc is the strongest. In order to obtain a high tensile strength, it is necessary to employ the purest aluminum and the purest zinc. Any impurities reduce the tensile strength. The magnesium and aluminum alloys are quite strong, but are more expensive than the aluminum and zinc mixtures.

QUESTION No. 862. We send you a sample of "Pearl Tin" which is made in Germany. You will notice that the surface is crystallized. How is it produced? Is it necessary to employ a special quality of tin?

Answer. The "Pearl Tin" is simply tin plate (iron or steel coated with tin by dipping into molten tin) that has been treated by a muriatic acid pickle. Immerse the sheets in a mixture of equal parts of muriatic acid and water until the crystals appear, then rinse well in clean water, dry and lacquer. The sample you have sent us has been lacquered in order to preserve the brightness of the surface.

QUESTION No. 863. We are using a stripping solution for stripping the brazing solder from brazed steel parts. We use an electrolytic process and a heavy deposit, which we suppose to be the carbonates of copper and zinc, is produced. We understand that this can be brought back to metal again and saved. We would like information about the method of doing it.

Answer. The only method of reclaiming the metal, which is probably a mixture of metal and carbonates or oxides, is to melt it under a flux in a crucible, but you will find that it will hardly pay you. The best method is to sell it to those who make a business of smelting copper bearing material or those who handle such material, a list of whom you will find in our advertising columns. It requires special furnaces and expensive equipment for smelting it, and it can only be done on a large scale. The amount you have will not pay you to attempt to reclaim and you can sell it for nearly as much as the copper in it is worth. The zinc in it is not paid for as it is a custom in the copper smelting business to pay for only the copper and other metals are not taken into consideration.

QUESTION No. 864. We are moving our plating department on an upper floor and are going to use a cat-iron drain pipe. We wish to know what is the best material to use for packing between the joints. We have been thinking of using asbestos roofing felt which is treated with pitch or tar. We have the usual hot lye and the different acid dips which will, of course, be washed out through the drain. What do you suggest as the best material for the purpose?

Answer. The use of the roofing felt, if of asbestos, will be all right if well coated with tar or pitch. Be sure it is of asbestos, however, as there is considerable material of this kind made that contains paper. Lead gaskets will be excellent as they are quite non-corrosive.

QUESTION No. 866. In the manufacture of linotype, monotype and stereotype metals, we find that our customers claim that our metals do not work as well as some of the other makers. We are new at the business, and while we have made babbitt-metals and solder for some time, do not seem to have "hit" the right method of making them. We know our mixtures are right as we have had samples of other manufacturer's metals analyzed. We use scrap metals entirely as we are unable to compete in price when we use new metals. Can you suggest anything that will aid us?

Answer. The difficulty with your metals is that you are using scrap of an unknown quality and contaminated with foreign metals and oxide. We do not know just what your customers find is the trouble with your metals, but if the mixture is right, it must be with the presence of impurities or oxide. To remove the oxide, place a stick of green wood in the bottom of the kettle and hold it down by an iron rod, then allow to remain, with the gases from it bubbling up through the molten metal for some time. Now remove it and throw a handful of rosin on the surface, skim and you will find that your metal will run more freely. The contamination of the metal with zinc and copper, the usual impurities, are difficult to remove and are, perhaps, the reason why your metal is not good. Scrap metals never make as satisfactory products in the soft metal line as new metals.

QUESTION No. 867. What process can be used to remove copper from a nickel solution so that it will not interfere with the nickel deposit? I have a nickel solution that contains considerable copper and I wish to remove it.

Answer. You will find no satisfactory method of removing the copper from your nickel solution. It can be done by passing hydrogen sulphide gas into the solution for some time, then filtering and boiling off the excess of the hydrogen sulphide gas that the solution has absorbed. The copper is precipitated as sulphide which remains in the filter. While this method is correct chemically, it is quite difficult to carry out in a plating room. Another method is to run the solution for several days on sheets of iron or steel, or any useless articles of brass. In this manner the copper will gradually work out. If your solution is badly contaminated, however, you will find it more satisfactory to throw it away and make up a new one.

QUESTION No. 869. How can small aluminum articles be satin-finished by a dip? We find such articles as bottle caps that must have been finished in this manner as it would not pay to use a satin-finish brush on them on account of the expense in handling.

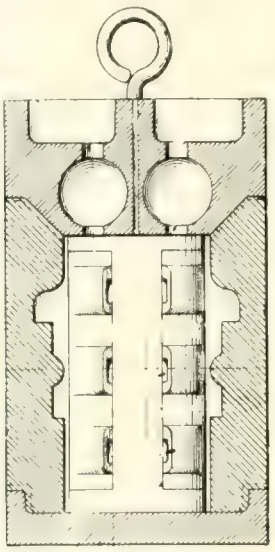
Answer. The aluminum may be satin finished by the following method: Make up a strong solution of caustic potash or caustic soda in water by dissolving 2 lbs. in 1 gallon of water. Heat nearly to boiling and then immerse the aluminum articles in it. As soon as gas begins to be given off freely, take them out and rinse in cold water. Then immerse in a dip composed of equal parts of water and nitric acid. This will remove the brown stain on the surface left by the potash or soda dip. The aluminum will now be clean and with a uniform dead surface. If not uniform or dead enough, the operation can be repeated. Rinse well after each dip and when the articles come from the acid dip, rinse first in cold water, then in hot water and dry.

QUESTION No. 870. How can manganese-bronze be made to show a tensile strength of 80,000 lbs. per sq. in. which we understand can be done? We are usually satisfied to obtain over 60,000 lbs. in sand castings.

Answer. The matter is one of casting, as there is no mixture that will give it better than the usual manganese-bronze formula. Small bars, poured against a chill and at a low heat will often give it, but the matter is one of uncertainty and cannot be obtained as a regular practice. Much care must be used in melting the metal. Quenching in water will also increase the strength of the castings.

Patent Abstracts.

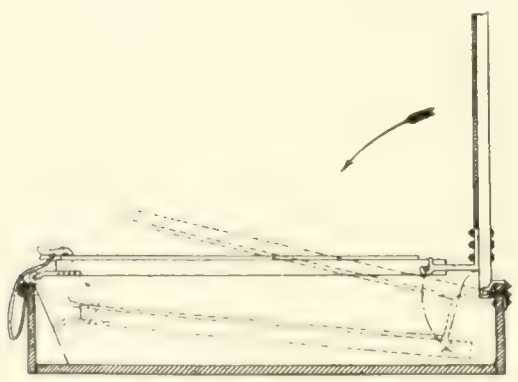
966,306, Aug. 2, 1910. MOLD FOR BRASS CASTINGS. Frederick E. Brown of Winona, Minn. A mold for casting car-brasses and similar articles. The features of the mold are the location of the gate so that filling the mold is assured, the formation of recesses for



holding the babbitt-metal used for lining the brass and rapidity of casting. The mold is made of cast-iron and the metal is poured directly into it from the top as shown. Risers shown over the mold are used for compensating for the shrinkage.

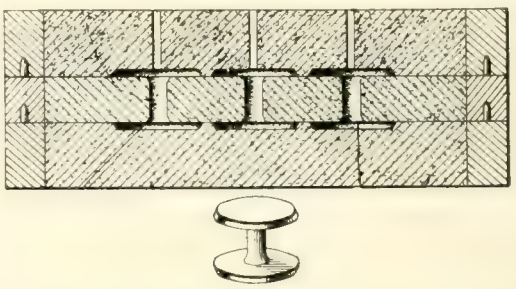
966,811, Aug. 9, 1910. MOLD FOR CASTINGS. Jacob K. Dimmick, of Philadelphia, Pa. A method of molding pipe. Several molds are used in series so that they may be opened or closed as one with a corresponding reduction in labor.

966,097, Aug. 2, 1910. MANUFACTURE OF SILVERED-GLASS MIRRORS. Emile Hoorickx of Brussels, Belgium. A device for immersing the mirror in an electroplating solution so that the silver on it may be protected



by a secondary covering. An acid copper solution is used and copper deposited on the silver. The object of the device is to immerse the mirror gradually and easily.

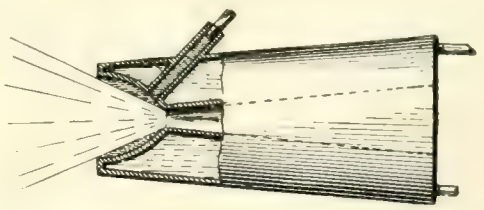
966,558, Aug. 9, 1910. METHOD OF MOLDING DOUBLE HEADED CHAPLETS AND OTHER ARTICLES. F. P. Johness of Columbus, Ohio. The chaplets are



molded in a three part flask as shown. The essential feature of the invention lies in the use of special match-plates not shown.

965,981, Aug. 2, 1910. PRODUCTION OF BLANKS FOR TABLE KNIVES. Ingvald Aasmund Bach of Trondhjem, Norway. A steel band is made by rolling so that the knives may be cut from it with less waste than is customary with the usual method.

966,704, Aug. 9, 1910. OIL-BURNING TWYER. John Pickles of De Soto, Mo. The oil passes into the heated jacket of the

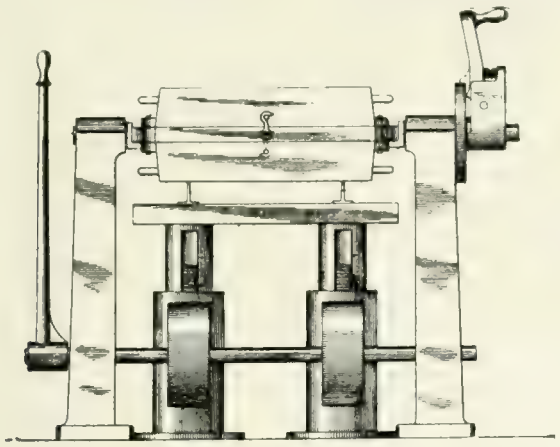


burner and is formed into gas before the blast reaches it. In this manner it is claimed that excellent combustion is obtained.

966,636, Aug. 9, 1910. LUBRICANT. Edward G. Acheson of Niagara Falls, N. Y. A method of making lubricants of oil and graphite. By the method used, it has been found that crude oil, kerosene and other oils that are of no value as lubricants, can be made excellent lubricants by mixing them with deflocculated graphite.

967,337, Aug. 16, 1910. PROCESS OF TREATING ASPHALTUM TO MAKE VARNISH. David T. Day of Washington, D. C. When asphaltum is treated with nitric acid, it divides into a portion heavier than water and one that is lighter. The portion heavier than water, the inventor says, when dissolved in benzol or other solvent, makes a very superior varnish which may be used instead of shellac or other material used for this purpose.

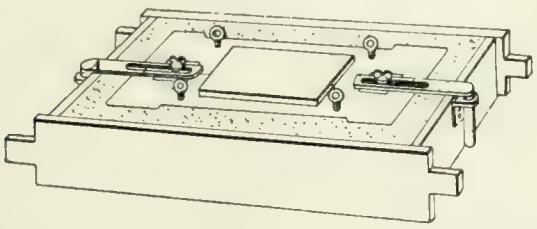
966,920, Aug 9, 1910. MOLDING MACHINE. James L. Hunter of Pittsburgh, Pa. A molding machine designed to facilitate the various operations in handling the mold.



Positive means are provided for tiltably supporting a match plate to which is attached a drag or check that can be disconnected.

968,350, Aug. 23, 1910. BLOWPIPE AND METHOD OF OPERATING SAME. Herbert C. Harrison of Lockport, N. Y. Assignor to the Electrometallurgical Co. A blowpipe for use in perforating iron or other high melting material. The principal object, however, is to use in cutting a highly siliceous slag. The feature of the blowpipe lies in the use of finely divided iron or other metal in connection with oxygen. The fine metal is driven in with the oxygen by a blast and burns at the mouth of the blowpipe producing intense heat.

966,762, Aug. 9, 1910. MOLDING APPARATUS. Otto F. Paehlke of Cleveland, Ohio. A device for use in molding so that

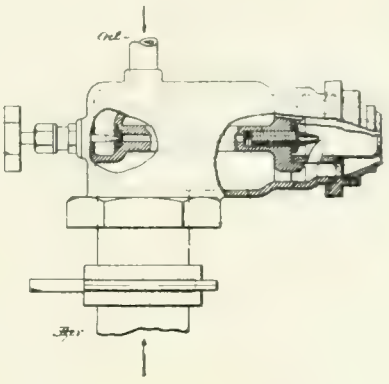


the pattern may be guided when drawn from the mold without distorting or abrading it.

967,327, Aug. 16, 1910. MEANS FOR MAKING RIVETS. Dwight G. Clark of Plainville, Conn. The wire or rod is cut off in the special machine to form the blank wedge-shaped at one end and notched at the other, then the notched end is indented and the wedge shaped end is headed.

967,592, Aug. 16, 1910. GRINDING OR POLISHING WHEEL. Cyra B. Wattles of Providence, R. I. A wheel so constructed that a strip of emery cloth or similar material may be securely fastened on the rim.

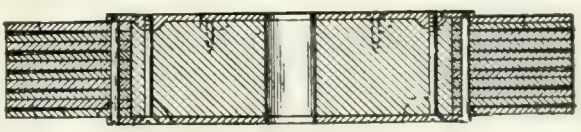
965,963, Aug. 2, 1910. BURNER FOR FUEL-OILS. Albert W. Thompson of Manchester, N. H. An oil burner for use in burning fuel-oil in heating or melting metals, or for other kinds of work. The burner is so constructed that a low pressure air supply



can be used and a fan employed for producing it. The oil is used at about 4 or 5 lbs. pressure and the air at from 6 to 8 oz. The burner is so constructed that the oil atomizes itself.

965,647, July 26, 1910. FLUX FOR BRAZING METALS. William W. McIver of New York City. A flux for use in brazing cast-iron. It consists of the following: Borax-glass 2 parts and potassium cyanide 1 part. The flux is used with ordinary brazing solder and the joint is heated by a blowpipe.

968,431, Aug. 23, 1910. POLISHING OR BUFFING WHEEL. Geo. P. Stevens of Chicago, Ill. A polishing or buffing wheel so constructed that the parts may be renewed when worn. The textile material used for the polishing or buffing is made in sections as



shown so that it may readily be inserted in the core. The core or hub is made of two flanges which are fastened together with screws and engage and clamp the cloth or felt rim when so fastened.

967,178, Aug. 16, 1910. TUBE-FORMING MACHINE. Thomas A. Edison of Llewellyn Park, N. J., and John F. Ott of Orange, N. J. A machine for making perforated tubes of sheet metal strips with imperforate edges. The tubes are then cut up into short sections and are filled with the material used in making the Edison storage battery. They are used in such a storage battery when completed.

Trade Items.

A new warehouse is being erected by the Cooper Oven Thermometer Co., of Terryville, Conn., manufacture of oven thermometers.

The Homestead Valve Mfg. Co., of Homestead, Pa., manufacturers of steam metal valves, have completed the addition to their brass and iron foundry. This addition is 30x 100 feet and practically doubles their capacity.

At the annual meeting of the Southington Hardware Co., of Southington, Conn., manufacturers of hardware specialties, the following officers were elected: President, James H. Pratt and J. H. Baldwin secretary and treasurer.

The Hawley Down Draft Furnace Co., of Chicago, Ill., manufacturers of oil melting furnaces and other fuel equipment, have moved to their new factory at 136 West Monroe St., in that city. The new plant is quite extensive, is operated by electricity and is modern in every way.

Chas. F. L'Hommedieu & Sons. Co., 24 South Clinton St., Chicago, Ill., manufacturers and dealers in plating supplies and equipment, desire to call attention to that fact that the oblique plating barrel which they have been manufacturing for some time, is now giving the best of satisfaction in a large number of establishments plating small metal goods.

The new building of the Kelly & Jones Company, Greensburgh, Pa., is being rushed. This consists of a concrete building 440 feet long and 4 stories high. The top floor will be devoted entirely to a brass foundry. Large additions are also being made to the power plant. This company manufactures steam metal valves and plumbers' brass goods. A new article in the shape of a rustless union is now being made. These are of iron, but are first treated by a special process, after which they receive a heavy deposit in an acid copper solution.

The Electric Smelting & Aluminum Co., of Lockport, N. Y., are now placing on the market a new material for use in cleaning metals preparatory to plating or lacquering. This material is quite unique and is entirely different from anything else on the market. It contains no fats or oils, and while it is extremely mild and will not effect the hands (it may be used for washing the hands), it seems to have a remarkable power of dissolving greases and oils. Even the mineral oils are removed from metals as rapidly as animal oils. The remarkable feature of the material is that, even when polished brass or other metals are allowed to soak in the solution for some time, as may frequently be necessary in removing buffing dirt, the metal is practically free from tarnish. The new discovery is of a mineral nature and a free sample will be sent to those who desire it. It has been produced after a large amount of experimenting.

The Canadian Fairbanks-Morse Co., are to install a brass foundry at the plant in Toronto, Canada.

The Latty Mfg. Co., of Ellicottville, N. Y., which recently built a factory in that place for the manufacture of tacks and small nails, are now in full operation.

The Electrical Equipment Co., 122 N. Broadway, Shawnee, Okhahoma, electrical engineers and contractors, are about to start a department for the refinishing of old chandeliers and gas fixtures and will also later carry on electroplating.

The Plant of the Vanrot Metal Co., of Lorain, Ohio, recently destroyed by fire, will be rebuilt at once. The loss was about $9,000. The manufacture of babbitt-metals, solder and white metal alloys is carried on. The business had been under way about a year when the plant was destroyed by fire.

The New Haven Sherardizing Co., have started in business at 1070 State St., New Haven, Conn., and will carry on sherardizing for the trade. They are operating under rights from the inventor and state that they will sherardize anything from "a watch-screw to an anchor." Sherardizing, as well known, consists of producing a coating of zinc on an article of iron or steel by heating with zinc dust.

The North American Smelting Co., 9th and Thompson Sts., Philadelphia, Pa., are one of the oldest manufacturers in their line and were established in 1865. They manufacture brass and phosphor-bronze ingot metals, babbitt-metals, type-metals of all kinds, solders and in addition specialize on Anti-Acid Bronze, Climax Bronze, Manganese-Bronze, both in ingots and castings. Among their products are lead and block tin pipe, tinners' and brazing solder and phosphor-tin. A more complete line of metal products would be difficult to find. The company consists of Geo. H. Colket and Robt. McLaughlin.

The Yale & Towne Mfg. Co., of Stamford, Conn., and general offices in New York City at 9 Murray St., have issued a new catalouge No. 20 which is the most extensive ever issued by a manufacturer of builders' hardware. The catalogue contains nearly 1000 pages of matter and is illustrated by many thousand engravings of the products of the company. Every article manufactured by the company is illustrated and the catalogue is a beautiful example of the printing art. This company are famous for the quality of the work they do and the well known and celebrated Yale lock is only one of their lines. They manufacture all kinds of locks from that on a bank door, to the most inexpensive padlock. As far as builders' hardware is concerned, the product of this company has always been noted for its artistic design and finish.

The Lumen Bearing Co., of Buffalo, N. Y., are sending out a booklet describing and listing the bushing patterns which they carry in stock.

The Crane & Breed Co., of Cincinnati, Ohio, coffin hardware manufacturers, are pushing work on their new building on West 8th. St., in that city. It will be four stories high.

The Duntley Mfg. Co., of Cincinnati, Ohio, manufacturers of vacuum cleaners, have leased a factory 528 Race St., in that city and will shortly move there. They are now located at 12 West 7th St.

The "Obermayer Bulletin" for August, issued by the S. Obermayer Co., of Cincinnati, Ohio, manufacturers of foundry supplies, contains interesting articles on "Patterns" and "Foundry Chemistry."

Grassler & Gezelchap, Milwaukee, Wis., manufacturers of gas and electric fixtures, have purchased property at 214 Third Ave., in that city and will use it for manufacturing. They are now located at 214 Grand Ave. They also conduct a plumbing business in connection with their manufacturing department.

The Thompson-White Mfg. Co., has been organized in Portland, Oregon, to manufacture gate valves. The capital stock is $250,000 and a foundry is to be erected. W. A. Thompson is the president of the company; T. White, vice-president and general manager; and H. S. Reynolds, secretary and treasurer.

A new factory is being erected at Chelsea, Mich., by the Grant & Wood Mfg. Co., for the manufacture of steel, brass and bronze balls. A process has been perfected by John J. Grant of the company, who is consulting engineer, which will greatly improve the quality of their steel balls. The new building will be 50x200 feet and will allow an increase in the output of the company.

The Great Western Smelting & Refining Co. of Chicago, Ill., one of the largest dealers and smelters of scrap metals in the United States, have opened a branch establishment in Detroit, Mich., to take care of the trade in that city and the surrounding district. The plant is located at Woodbridge and Bates St., and is under the management of I. M. Jacobson. A full stock of their products will be carried in Detroit. This plant is now the ninth branch operated by the company.

The Naulty Smelting & Refining Co., 2612-2618 Martha St., Philadelphia, Pa., are now manufacturing an entirely new metallic alloy which they have called "Chromax-Bronze". This bronze is a white metal containing a large percentage of nickel, and to which has been added a certain percentage of chromium to harden it. It has now been thoroughly established that chromium is a great hardener and strengther of metals, and the bronze made by this company shows a very high tensile strength. The alloy was recently patented and a description of the properties of it will be given in our October issue.

A new three story building on Queen St., is to be erected by A. H. Caplan & Co., Ltd., of Ottawa, Canada, for the manufacture of babbitt-metals and other white metal alloys.

The Lattimer Stove Co., 421 West Spring St., Columbus, Ohio, manufacturers of stoves, are considering the installation of an electro-galvanizing plant at their works.

The Jonathan Bartley Crucible Co., of Trenton, N. J., have appointed Francis Hyde & Co., of Montreal their Canadian agents for the sale of their crucible and other products in the Dominion of Canada.

A new concern for the manufacture of spectacles, eye-glasses and mountings is to be started in Geneva, N. Y., by Hobart H. Gray, formerly superintendent of the Standard Optical Co., of that city. It is said that the company will be capitalized at $150,000.

The Rockhoff Foundry Co., are building a new aluminum foundry in South Bend, Ind. The foundry will be 40x100 feet and will be used principally for the manufacture of automobile castings. This company are now located in Fostoria, Ill. The new plant will be near that of the Simplex Motor Car Co.

The Eagle Brass Works of Chattanooga, Tenn., has been sold by the estate of Wm. Moffett, the former proprietor, to H. L. Hiebeck and C. L. Martin. They will operate it under the firm name of Hiebeck and Martin. The original company was founded by Wm. Moffett twenty-five years ago.

The Smith Electric Co., 13 West 5th St., Charlotte, N. C., are now commencing the manufacture of gas and electric fixtures. They are starting an electroplating and polishing plant and are in the market for platers' supplies and equipment. Samuel J. Smith is the manager.

H. M. Shimer & Co., 19th St., and Washington Ave., Philadelphia, Pa., smelters and refiners, announce that they have a patented process for smelting aluminum chips and borings. They will take them subject to sample, and refine them with the production of aluminum ingots at a price agreed upon per pound, and guarantee the customer a certain amount of loss. They are already doing this for a number of concerns with excellent satisfaction.

The first prosecution made under the new jewelry stamping law of New York State has just been carried out and the convictions made. Simon Terrace, a manufacturing jeweler of 281 Grand St., New York City, was sentenced to pay a fine of $250 or serve 60 days in jail. His brother-in-law, Moses Cohen, was allowed to go without sentence, but was reprimanded by the judge for his connection with the matter. The business was conducted under the name of C. Terrace, the wife of the real proprietor. The goods they manufactured were shown by assay to be from 6 to 11 Karat when they were all stamped 14 Karat. This case was really a test one, and resulted in conviction.

The American Bronze Co., of Berwyn, Pa., manufacturers of brass and bronze castings, are to erect a one story building as an addition to their plant. It will consist of brick and steel of standard construction.

The Stiles Mfg. Co., recently incorporated at Parkersburgh, W. Va., are now operating a brass foundry and produce brass, bronze and aluminum castings. An extensive line of machinery of a special nature is the principal product of the company.

The O. J. Warman Aluminum Foundry & Machine Co., has been incorporated in Madisonville, Ohio, with a capital stock of $15,000 to make aluminum castings. The incorporators are O. J. Warman, R. Warman, R. E. Morrison, C. A. Nagel and S. Ross Jr.

The Ohio Brass Co., of Mansfield, Ohio, manufacturers of plumbers' brass goods, have commenced the manufacture of babbitt-metals for the trade. They will place on the market genuine babbitt made after the original formula.

The Fargo Plumbing & Heating Co., 112 Broadway, Fargo, North Dakota, are now preparing to enter the manufacture of electric and combination fittings and fixtures and will need supplies in the shape of new materials for them.

The plant and business of the Chandelier & Art Brass Co., of Richmond, Ind., manufacturers of gas and electric fixtures, has been purchased at a receivers' sale by Richard Sedgwick. The company has been in the hands of a receiver for some time.

The Independent Stove Co., of Owosso, Mich., manufacturers of kitchen ranges, are now using black nickel on their stoves in place of white nickel as generally employed. This company are the first to use a black nickel deposit on stoves and their product, therefore, is a novelty in its line.

P. H. Bonvillain & E. Ronceray of Paris, France, who recently appointed the E. H. Mumford Co., of New York City their agents in this country for the manufacture and sale of their universal molding machines, have purchased back the patent rights for the United States of their machines.

The business of the Bay State Brass Co., of Haydenville, Conn., manufacturers of plumbers' brass goods, will probably be continued as the creditors believe it advantageous. The company is now in bankruptcy. Stephen Jorgensen has resigned his position as superintendent and S. S. Cassard is now in charge of the works.

The Harshaw, Fuller & Goodwin Co., of Cleveland, Ohio and New York City, announce to the trade that they are now carrying a more complete line of plating supplies than ever before, and in addition are now handling plating dynamos, polishing lathes and a complete line of tanks and other equipment. Geo. L. Wallace is now representing them in the East.

A new factory is to be built by the National Clock & Electric Co., of St. Louis, Mo.

The Hauck Mfg. Co., of Brooklyn, N, Y., manufacturers of fuel oil burning devices, torches, mold drying apparatus, etc., have moved to 140 Livingston St.

The Huntington Novelty Mfg. Co., of Huntington, W. Va., are purchasing presses and equipment for the manufacture of metal novelties.

A new four story building has been erected by the Superior Mfg. Co., of Pittsburgh (N. S.), Pa., manufacturers of gas stoves, etc., and which will give them increased capacity. The building is 40 x 80 feet.

The Lennox Furnace Co., of Marshalltown, Iowa, manufacturers of steel ranges, have increased their capital stock from $250,000 to $350,000, and will extend their business. A large factory for the manufacture of steel ranges will be built in the spring.

R. B. Seidel, Inc., of Philadelphia, Pa., manufacturers of graphite crucibles are considering the erection of an additional kiln which will give them increased capacity. Recent improvements made by them have increased their capacity 30 per cent.

Geo. C. Prentice & Co., 30 Lenox St., New Haven, Conn., manufacturers of automatic machinery, have purchased the motor cycle business of L. E. Rhodes of Hartford, Conn., and will commence the manufacture of automobiles and trucks.

The Rushmore Dynamo Works of Plainfield, N. J., manufacturers of automobile and search lights, and the R. E. Dietz Co., of New York City, manufacturers of lanterns and lamps, have combined and the good features of each company's product will be combined.

The Westinghouse Electric & Mfg. Co., has purchased 70 acres of land in Trafford City, Pa., adjoining that of the Westinghouse Machine Co. and will build a new foundry there. All the foundries of the company in other localities will then be centralized here and all the foundries of the Westinghouse interests will likewise be located in this place.

The Rockwell Furnace Co., 26 Cortlandt St., New York City, announce that Chas. F. Kenworthy, the well known furnace engineer, is now connected with them and will represent them in the United States and Canada. Mr. Kenworthy was formerly connected with the American Brass Co., of Waterbury, Conn., and has devoted his attention to furnace construction during the past eighteen years.

The Schatz Mfg. Co., are now occupying their new factory in Poughkeepsie, N. Y., where excellent facilities are had for manufacturing. This company recently moved from Chappaqua, N. Y., and manufacture hardware specialties and carry on electroplating. Owing to the rapid increase of their business, they have already found their new plant to small and additions will shortly be built.

The Compton Shear Co., Newark, N. J., manufacturers of shears, are to increase their plant by the erection of a three story building.

The Crown Stove Co., has been incorporated in Cicero, Ill., with a capital stock of $60,000 for the manufacture of stoves.

The C. W. Kelsey Mfg. Co., will build a new plant in Hartford, Conn., for the manufacture of motor-cycles.

The Naugatuck Mfg. Co., of Naugatuck, Conn., manufacturers of seamless copper floats by electrodeposition, are enlarging their depositing department.

The Pitner Pump Co., has been incorporated at 24 West Michigan St., Chicago, Ill., with a capital stock of $20,000 to manufacture automobile pumps.

The Southbridge Goggle Mfg. Co., is to start in business in Southbridge, Mass., and will manufacture automobile goggles. The company will be started by J. Z. Le Page, formerly with the Southbridge Optical Co.

A plant for the manufacture of stoves will be built at old Manchester Road, St. Louis, Mo., by Hemp & Co. It will be erected at once at a cost of $100,000. This company now operate a plant at Second St., and Chouteau Ave.

The Howe Mfg. Co., of Louisville, Ky., and the Stockham Pipe Fittings Co., of East Birmingham, Ala., have been consolidated under the name of the Birmingham Valve & Fittings Co., with headquarters at Birmingham. A plant will be built for manufacturing.

At the recent fire, during which the plant of the Thomas Brass & Iron Co., at Waukegan, Ill., was destroyed, the plant of the Durand Steel Locker Co., was also burned with total loss. The plant of the latter company adjoined that of the Thomas Brass & Iron Co.

The largest contract for metal furniture ever placed, has been awarded the Canton Art Metal Co., of Canton, Ohio. The contract calls for over $100,000 worth of furniture and will be used in the new California State Hall of Records, now building at Los Angeles, Cal. It is expected that the shipment will require 20 freight cars.

The Newfield Plating Company, which has been in business some time at 388 John St., Bridgeport, Conn., has now incorporated with a capital stock of $10,000. The incorporators are Frank S. Pond, Geo. G. Guggenheim and Fred R. Griffith. Jobbing plating is carried on and a specialty made of fine silver and gold plating.

The McKenna Bros. Brass Co., of Pittsburgh, Pa., manufacturers of window display fixtures and other brass goods, have severed their connection with the Firth-Sterling Steel Co., of Demmler, Pa., as selling agents, and have taken the agency for the Vanadium-Alloys Steel Co., of Latrobe, Pa. Wm. H. McKenna is in charge of the tool steel department.

The Chicago Steel & Brass Works of Chicago, Ill., have gone into bankruptcy.

The Rockwood Sprinkler Co., Worcester, Mass., manufacturers of automatic sprinkler systems, are to erect a new plant at a cost of $100,000.

The Pioneer Brass Works of Indianapolis, Ind., are building an addition to their foundry which will be used as a core-room, stock room and storehouse.

The Economy Oil Cup Co., Montgomery Building, Augusta, Ga., are now manufacturing a new oil cup which they are placing on the market for use on bearings. The company was recently organized.

The Roberts Portable Oven Co., 400 West Erie St., Chicago, Ill., manufacturers of enameling, lacquering and core ovens, have purchased a site in that city and will erect a new plant.

The Yale Jewelry Co., of Providence, R. I., have brought suit against Simms & Co., Inc. of Attleboro, Mass., manufacturing jewelers, alleging breach of contract in regard to an improved machine for forming collar buttons.

The Simms Magneto Co., manufacturers of automobile magnetos, are soon to commence the erection of a plant at Watsessing, N. J., for the manufacture of their product. The building will be 150x300 feet and two stories high.

The plant of the Wm. A. Rogers Co., Ltd., at Northampton, Mass., manufacturers of cutlery, is to be enlarged by an addition 40x46 feet and two stories high. This factory is a branch of the main plant at Niagara Falls, N. Y.

The Addressograph Co., of Chicago, Ill., manufacturers of addressing machines, are receiving bids for the installation of equipment in their new factory on West Van Buren St. This company are the largest manufacturers of addressing machines in the country.

Frederick B. Stevens of Detroit, Mich., manufacturer of foundry supplies and equipment, and electroplaters supplies, has opened a branch in Chattanooga, Tenn., to supply the trade in that section. It is being conducted under the name of the Dixie Foundry Supply Co.

The Aluminum Co., of America are making extensive additions to their sheet, tube and stamping departments in New Kensington, Pa. Two buildings, 40x116 are being erected. One is to be used as a melting department and the other as a scrap department. New machinery is being installed in the tube department.

The H. F. Barrows Co., of North Attleboro, Mass., announce that they are now the owners of the automatic chain soldering machine recently patented by Geo. H. Benjamin and illustrated and described on page 288 of the August issue of THE BRASS WORLD. This machine automatically solders the butt-ends of chain links.

Current Metal and Supply Prices.

These Prices are net and are for moderate quantities. Smaller quantities command higher prices. Prices subject to fluctuation.

Acetone, pure, 98-99%	lb.	.22
Acid, Acetic, pure, 30%	lb.	.07
Acid, Arsenious (White Arsenic)	lb.	.20
Acid, Benzoic	lb.	.55
Acid, Boracic (Boric), pure	lb.	.12
Acid, Hydrochloric, see Acid, Muriatic.		
Acid, Hydrofluoric, 30%	lb.	.04
Acid, Hydrofluoric, 50%	lb.	.10
Acid, Muriatic, 20°	lb.	.02
Acid, Muriatic, c. p., 20°	lb.	.07
Acid, Nitric, 38°	lb.	.05⅝
Acid, Nitric, 40°	lb.	.05⅞
Acid, Nitric, 42°	lb.	.06¼
Acid, Nitric, c. p.	lb.	.08
Acid, Sulphuric, 66°	lb.	.01¾
Acid, Sulphuric, c. p.	lb.	.06
Alcohol, Wood	gal.	.50
Alcohol, Denatured	gal.	.55
Alum	lb.	.04
Aluminum, Sulphate	lb.	.06
Aluminum, Metallic, in Ingots	lb.	.22
Aqua-Fortis, see Acid, Nitric.		
Ammonia Water (Aqua-Ammonia), 20°	lb.	.04¾
Ammonia Water (Aqua-Ammonia), 26	lb.	.06¼
Ammonia Water, c. p.	lb.	.08
Ammonium Carbonate, lump	lb.	.15
Ammonium Chloride (Sal-Ammoniac)	lb.	.12
Ammonium Hydrosulphuret	lb.	.30
Ammonium Sulphate	lb.	.07
Ammonium Suphocyanate	lb.	.50
Amyl Acetate	gal.	1.85
Antimony	lb.	.08¼
Arsenic, Metallic	lb.	.15
Arsenic, White (Acid Arsenious)	lb.	.20
Argols, White (Cream of Tartar)	lb.	.31
Asphaltum, Commercial	lb.	.05
Asphaltum, Egyptian (Bitumen)	lb.	.30
Benzine	gal.	.15
Benzol, Pure	gal.	.75
Bismuth, Metallic	lb.	1.85
Bitumen, see Asphaltum.		
Blue-Vitriol, see Copper Sulphate.		
Borax, Crystals or Powdered	lb.	.10
Borax Glass	lb.	.35
Cadmium, Metallic	lb.	.70
Carbon Bisulphide	lb.	.10
Calcium Carbonate (Precipitated Chalk)	lb	.10
Chrome-Green	lb.	.50
Copper, Lake, (carload)	lb.	.12⅞
Copper, Lake, (cask)	lb.	.13⅛
Copper, Electrolytic, (carload)	lb.	.12⅝
Copper, Electrolytic, (cask)	lb.	.12⅞
Copper, Casting, (carload)	lb.	.12½
Copper, Casting, (cask)	lb.	.12¾
Copper Acetate (Verdigris)	lb.	.35
Copper Carbonate, dry	lb.	.25
Copper Sulphate (Blue-Stone)	lb.	.09
Copperas, see Iron Sulphate.		
Corrosive Sublimate, see Mercury Bichloride.		
Cream-Tartar, see Potassium Bitartarate.		
Cryolite	lb.	.12
Cyanide, see Potassium Cyanide.		
Dextrin	lb.	.15
Emery Flour	lb.	.04
Emery, F F & F F F	lb.	.03
Flint, powdered	lb.	.01
Fluor-Spar	lb.	.01¼
Fusel-Oil	gal.	1.75
Gold Chloride	dwt.	.60
Gum Copal	lb.	.30
Gum Guiacum	lb.	.26
Gum Mastic	lb.	.70
Gum Sandarac	lb.	.35
Gum Shellac, brown	lb.	.50
Gum Shellac, white	lb.	.60
Iron Perchloride	lb.	.25
Iron Sulphate (Copperas)	lb.	.05
Lead Acetate (Sugar of Lead)	lb.	.15
Lead, Pig	lb.	.04½
Lead, Red	lb.	.12
Lead, Yellow Oxide (Litharge)	lb.	.12
Liver of Sulphur, see Potassium Sulphide.		
Manganese, Ferro, 80%	lb.	.10
Manganese, Metallic, pure	lb.	.75
Magnesium, Metallic	lb.	1.50
Mercury Bichloride (Corrosive Sublimate)	lb.	.93
Mercury, Metallic (Quicksilver)	lb.	.46
Mercury Nitrate	lb.	1.50
Mercury Oxide, yellow	lb.	1.80
Nickel and Ammonium Sulphate (Double Salts)	lb.	.16
Nickel Carbonate, dry	lb.	.60
Nickel Chloride	lb.	.50
Nickel Metallic	lb.	.47
Nickel Sulphate (Single Salts)	lb.	.25
Nitre (Saltpetre), see Potassium Nitrate.		
Oil of Vitriol, see Acid, Sulphuric.		
Paraffine	lb.	.15
Phosphorus, yellow	lb.	.40
Phosphorus, red	lb.	1.10
Pitch	lb.	.05
Plaster of Paris, Dental	bbl.	4.00
Platinum Chloride	oz.	18.00
Platinum Metallic	oz.	34.00
Potash-by-Alcohol, in sticks	lb.	.50
Potash, Caustic (Potassium Hydrate)	lb.	.08
Potassium Bichromate	lb.	.14
Potassium Bitartarate (Cream of Tartar)	lb.	.31
Potassium Carbonate (Pearlash)	lb.	.10
Potassium Chlorate	lb.	.15
Potassium Cyanide	lb.	.25
Potassium Iodide	lb.	2.25
Potassium Nitrate (Nitre or Saltpetre)	lb.	.10
Potassium Permanganate	lb.	.17
Potassium, Red Prussiate	lb.	.60
Potassium, Yellow Prussiate	lb.	.24
Potassium Sulphide (Liver of Sulphur)	lb.	.15
Potassium Sulphuret, see Potassium Sulphide.		
Potassium Sulphocyanate	lb.	.70
Pumice, Ground	lb.	.05
Quartz, Powdered	lb.	.01
Rosin, Yellow	lb.	.04
Sal-Ammoniac, see Ammonium Chloride.		
Sal-Soda, see Sodium Carbonate.		
Silver Chloride, dry	oz.	.75
Silver Cyanide	oz.	1.00
Silver, Fine	oz.	.52⅞
Silver Nitrate, crystals	oz.	.50
Soda-Ash	lb.	.05
Sodium Biborate, see Borax.		
Sodium Bisulphite	lb.	.15
Sodium Carbonate (Sal-Soda), crystals	lb.	.02
Sodium Hydrate (Caustic Soda)	lb.	.05
Sodium Hydrate (Caustic Soda) by Alcohol (in sticks)	lb.	.45
Sodium Hyposulphite ("Hypo")	lb.	.04
Sodium Metallic	lb.	.90
Sodium Nitrate	lb.	.05
Sodium Phosphate	lb.	.09
Sodium Silicate (Water-Glass)	lb.	.04
Soot, Calcined	lb.	.15
Spelter, see Zinc.		
Sugar of Lead, see Lead Acetate.		
Sulphur (Brimstone) in lump	lb.	.05
Tin Chloride	lb.	.43
Tin, Metallic	lb.	.35½
Turpentine, Venice	lb.	.35
Verdigris, see Copper Acetate.		
Water, Distilled	gal.	.15
Water-Glass, see Sodium Silicate.		
Wax, Beeswax, yellow	lb.	.45
Wax, Carnauba	lb.	.70
Whiting (Ground Chalk)	lb.	.02
Zinc Carbonate, dry	lb.	.19
Zinc Chloride	lb.	,12
Zinc, Sulphate	lb.	.06
Zinc, (spelter)	lb.	.05½

THE BRASS WORLD AND PLATERS' GUIDE

VOL. VI. BRIDGEPORT, CONN., OCTOBER, 1910. No. 10.

A MONTHLY JOURNAL

devoted to the Art of Refining, Alloying, Casting, Rolling, Founding and Electroplating of all the non-ferrous metals and their alloys.

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High Tensile Strength Manganese-Bronze.

The recent issuing of specifications by a certain user of manganese-bronze, calling for 80,000 lbs. per sq. in. tensile strength in the castings with 40,000 lbs. elastic limit, and the actual meeting of the specifications by a maker of manganese-bronze, have brought forth considerable comment from other makers in regard to the method of doing it.

The mixture used by the leading makers of manganese-bronze varies but little, and to such a slight degree that it would be impossible for any marked difference to be obtained in the physical qualities when made by the different producers. In other words, the *actual* strength of the bronzes of each maker does not vary to any great extent. The high tensile strength, therefore, must be obtained by the actual manipulation in casting. To obtain a high tensile strength on manganese-bronze the following method is pursued:

Those who issue specifications for manganese-bronze, usually state how the test-piece shall be cast. In this respect the specifications are apt to vary widely. One specification may call for the casting of the test-piece on the casting. Another may require that it shall be cast separately but in a certain way in sand. Others may not give the method of making the test piece, and it is this last loose practice that enables the maker of the manganese-bronze castings to obtain the high tensile-strength. This is how it is done:

The castings, of course, are made in sand.

The test-piece is made in a chill mold and perhaps machined in addition. It is a well known fact that manganese-bronze, when cast in a chill mold, will give a very much higher tensile-strength and elongation than when cast in sand. It is often the case that fully 50% more strength can be obtained by this method. As far as the elastic limit is concerned, the method of determining it has been the subject of so much discussion that the obtaining of 40,000 lbs. per sq. in. cannot be taken seriously. It is usually considered that the elastic limit of manganese-bronze may be varied according to the method of determining it.

The obtaining of a high tensile-strength on manganese-bronze, therefore, is the result of casting the test-piece in a chill mold. The practice is legitimate as it conforms to specifications, but the day is approaching when such a method will not be tolerated. The test-piece should always be cast in sand and at the same time as the casting.

Automobile Steering Wheel Spiders.

It is a matter of surprise to us that so many automobile manufacturers still persist in using aluminum castings for the spiders of the steering wheel. In the mad rush to obtain light cars, the very small increase in weight that would follow the use of a brass or bronze spider is not taken into consideration.

We are convinced that aluminum is greatly over-rated as a structural material. We hear of certain tests being made in which aluminum castings have shown from 30,000 to 50,000 lbs. per sq. in. in tensile strength which is interesting only as it does not have any bearing upon the actual strength of the general run of castings turned out in an aluminum foundry at the present time. We believe that the average aluminum casting turned out as a steering wheel spider will not show any more strength than poor cast iron. Would the purchaser of an automobile tolerate the use of cast-iron for this part of his car? We think not. Examine a number of aluminum steering wheel spiders and notice the number of blowholes in them. We will frankly say that it is a shame to use such castings, or rather such metal.

The automobile of the future is to be a *safe* car. There is no more vital part than the steering gear and accessories. We feel sure that aluminum is not the right metal for the purpose. There is too much uncertainty in it, and while one sample casting may be quite satisfactory, it is almost impossible to turn out equally as good castings day after day.

The shape of the spider is such that a casting must be used. It is with much satisfaction that we notice the tendency, among the leading makers, to abandon the aluminum wheel for one of manganese-bronze, and such a change is a very laudable one. More satisfactory yet would be a 10% aluminum bronze as it is better adapted for the purpose. It is tougher than manganese-bronze, and equally as strong, and when polished has a fine color. It matters not, however, what is used as long as aluminum is not. Even yellow brass is preferable to aluminum, we believe, and if automobile manufacturers would investigate the quality of the aluminum that they are putting into their wheels, they would find much to astonish them. So vital a part as the steering wheel of an automobile needs more attention than has been given it in the past. Let the user demand something besides aluminum. He will safeguard himself by doing so.

Rinse Water in Plating.

From the number of cases that recently have come to our notice we are firmly convinced that much of the difficulty experienced in the plating room is caused by the use of unclean rinse water. In many localities water is more or less costly, and the plater is constantly admonished to economize as much as possible. While there is no reason for wasting water, it is the poorest kind of economy to attempt to carry the saving too far.

As a usual rule cold rinse water is clean. It is kept running and there is little cause to complain about it. The hot rinse water, however, is different. This is rarely kept running, and is used in a barrel. Now theoretically, if all the plating solution is rinsed off in the cold water, there can be no contamination of the hot water, but it is seldom that this is the case. When the hot rinse water is dirty, it always leaves a film of dirt on the plated work, either to stain it immediately, or to corrode it in the future.

We suggest paying more attention to the hot rinse water, and see that it is kept clean. It is to be found a good investment.

Yellow Brass Chips and Their Relation to the Manufacture of Brass Ingot.

The principal raw material for the manufacture of yellow brass ingot is yellow brass chips. In addition to such chips, the other source is the so-called light brass. By light-brass is meant the miscellaneous assortment of yellow brass scrap that is found in the scrap metal trade, such as old lamps and lamp-burners, bird cages, upholstery hardware, clocks, buckles or any other articles made of sheet brass or wire. Brass castings are known as heavy-brass. Light-brass is a very unsatisfactory class of material for making brass ingot for the reason that it contains a large amount of iron or steel that cannot be separated completely, and, therefore, the brass ingot is usually contaminated with iron. Light brass, accordingly, is used only for making the cheapest kind of ingot metal.

Chips are the material from which practically all the yellow brass ingot now found on the market is made. Two kinds are found:

1. Yellow brass chips produced in the machining of brass rod. These are known as "rod-chips" and are principally made in the manufacture of small brass goods upon automatic machines. Machine screws, studs, pins and a large variety of similar articles are made in this manner and with a corresponding quantity of chips.

2. Yellow brass chips from castings. These are made in the machining of yellow brass castings. They are very much inferior to the rod-chips as will be subsequently explained.

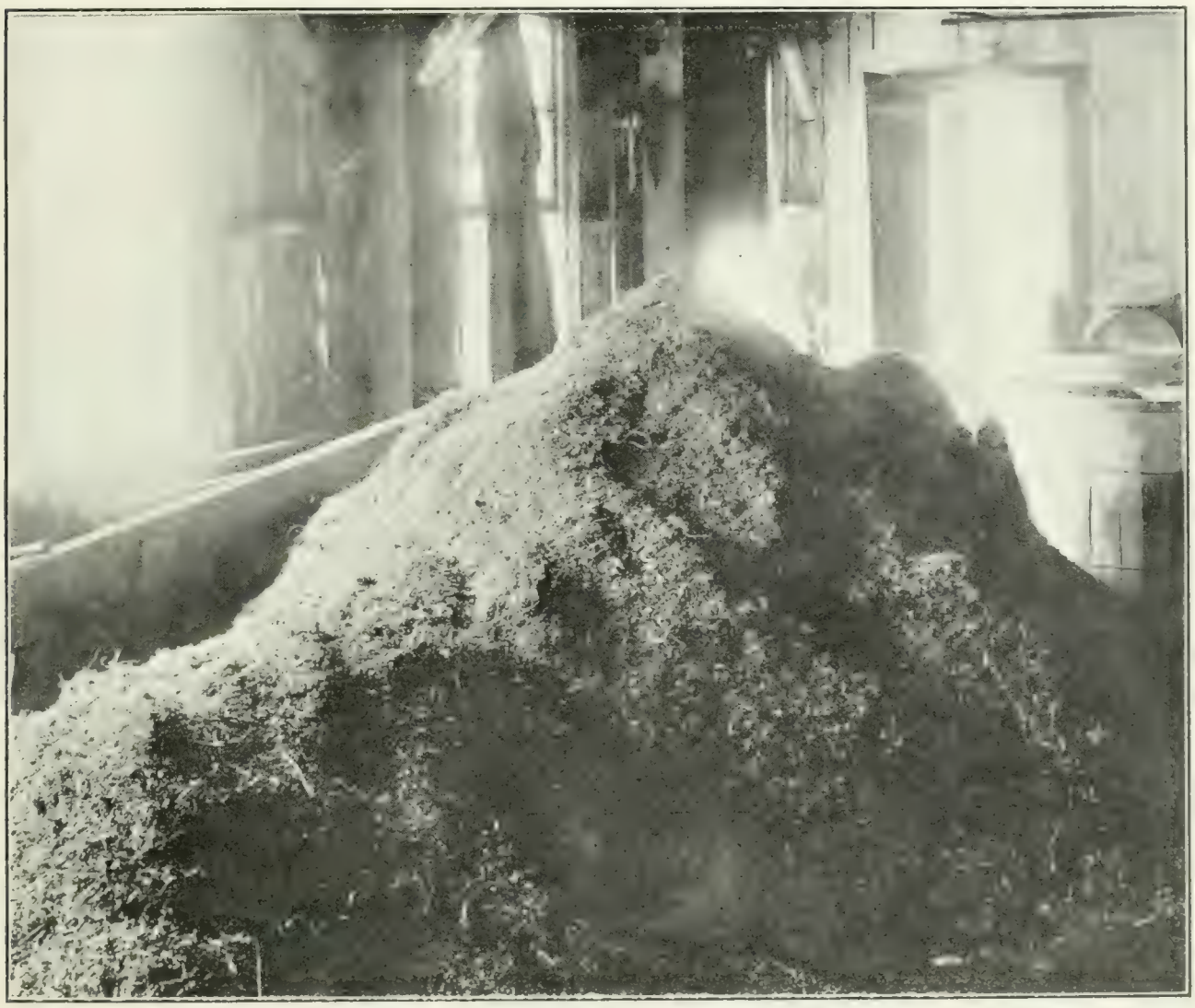


Fig. 1. Yellow Brass Chips from the Machining of Brass Rod. The Customary and Best Raw Material for Making Brass Ingot.

Rod-chips are the choicest material in the chip line. Not only is brass rod very uniform in mixture, but it is always free from aluminum and other impurities that may be present in brass casting chips. The average composition of yellow brass rod chips is as follows:

Copper	62.50%
Zinc	35.25%
Lead	2.25%

This is practically the standard rod mixture and all the brass rolling mills employ it with little or no variation. An analysis of a sample of brass rod, ¾ in. in diameter and used for making screws, gave the following results on analysis:

Copper	62.37%
Zinc	35.31%
Lead	2.21%
Iron	0.11%

Some makers use slightly more copper and less lead, but the largest brass rolling mills adhere to the preceding mixture as closely as possible.

Chips made from brass rod are frequently known as "screw-rod chips" for the reason that they are formed in the manufacture of screws. Chips resulting from the manufacture of wood screws must not be confused with those made in the manufacture of machine screws. The making of wood screws requires a different brass mixture for the reason that the head of the screw is upset and the mixture must be free from lead. The following is an analysis of a brass wood screw:

Copper	70.01%
Zinc	29.82%
Lead	.08%
Iron	.09%

The chips from wood screws, however, are easily distinguished as they are long and stringy, while those made from leaded rod are short and brittle. Very little of the wood screw chips finds its way into the scrap metal market, and the quantity is so insignificant that it can be left out of consideration.

Yellow brass chips are usually more or less oily, and the only harm that this can do is to alter the actual weight of brass. Otherwise it does not harm them. The use of centrifugal machines for extracting the oil, however, is now more or less wide, and most of the chips found in the trade are fairly dry. If they are too greasy or oily, it is often difficult to put them through a magnet machine.

In selecting yellow brass chips for making ingot, the presence of long and stringy chips should be taken as a bad indication. While such chips may be good brass, it frequently happens that unscrupulous dealers will mix Tobin-bronze or manganese-bronze chips with them. If such chips are reddish colored and long and tough, beware of them. Good rod chips are quite short and of a good, yellow brass color.

The principal contaminating material in brass chips is iron. It is a practical impossibility to keep the chips free from it. Manufacturers frequently say, when selling a lot of rod chips, that they have made them in their own factory: "They are *absolutely* free from iron. We never use anything but brass on the machines, etc." When a statement of this kind is made, look over the chips carefully and broken drills, nuts, screws and other machine shop articles will always be found in them. The manufacturer is, of course, honest in his ideas, and he does not realize how difficult it is to keep the iron out. Were such chips used in making brass ingot, without putting them through a magnet machine, customers would surely find the iron and, perhaps, much to his financial loss through ruined tools. If there is any one quality that brass ingot users now expect, it is the freedom of the ingot from iron. Not as combined iron as this does no harm, but as uncombined iron in the form of shot or minute pieces of a steel-hard nature that ruin tools so rapidly.

The only "salvation" of the brass ingot maker is to use the magnet machine on his chips previous to melting. In order to be safe, a *good* machine should be used. One with a strong magnet only is satisfactory. Poor machines do not completely remove the iron. It is needless to say that those with electro-magnets are the most satisfactory. The chips should be put through the machine in a careful manner and *all* the iron removed. When this has been done, if rod chips are used, the ingot made from them will be of the highest grade and of great purity. It will usually run from 63 to 65 per cent in copper. If customers desire a higher percentage of copper, the brass will have to be "fattened" by copper or other metal rich in copper.

The most unsatisfactory kind of yellow brass chips are those made from yellow brass castings. Aluminum is now so extensively used in yellow brass, that it is difficult to find

a lot of chips made from castings that will not contain it. While many users of brass ingot use a little aluminum in their mixtures of yellow brass, the ingot maker cannot safely use it in his ingot unless he knows his customer will not object. He is obliged to make an ingot free from it. As a rule, consumers prefer to purchase brass ingot free from aluminum, and if they use it in their mixtures, they can add the right quantity themselves.

As a usual rule, chips from yellow brass castings are sufficiently high in copper to satisfy the requirements, but the presence of considerable iron and particularly the aluminum in them render them quite an uncertain raw material for the brass ingot maker. The most satisfactory material he can use are rod chips well magneted, and when he does, his customers will usually remain with him.

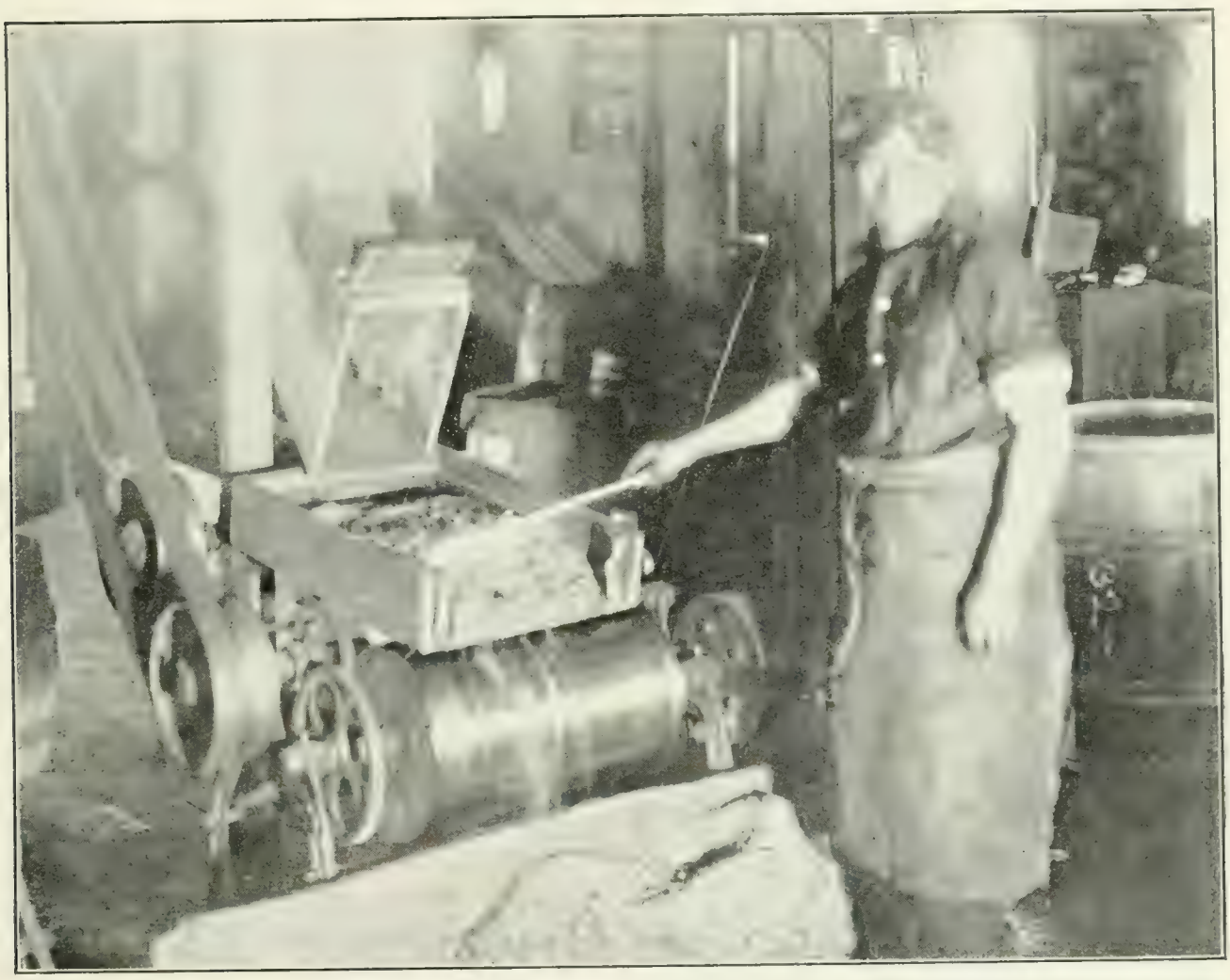


Fig. 2. Magneting the Chips for Removing the Iron Previous to Melting Them into Brass Ingot.

As an example of the character of yellow brass chips made from brass castings, the following analysis will serve to illustrate how unsatisfactory they are. It was made upon a lot of chips obtained from a dealer:

Copper	67.12%
Zinc	28.06%
Lead	3.34%
Iron	0.75%
Tin	0.59%
Aluminum	0.14%

Iron and steel are injured to a certain extent by pickling. The hydrogen gas evolved during the pickling is absorbed and decreases their strength.

Scrap zinc is now very apt to contain aluminum and care should be exercised in removing it. Owing to the similarity in color, particularly when corroded, it is usually quite difficult to distinguish between them and it is rare that more or less aluminum will not be found in a miscellaneous lot of sheet zinc scrap.

Notes on Light Alloys for Use in Air Ships.

By F. Jablonski.

Ever since the air-ship came into prominence, a strong rivalry has existed among the manufacturers of light metals and other industries engaged in the manufacture of construction material. In Germany, the best metal at one time was that known as "Chrominium" and manufactured by the firm of "Berg." This metal, however, has now been superseded by other new metals.

Last year, at the aeronautic exhibition in Frankfort, Germany, several new, light metal alloys were judged upon their adaptability to air-ship construction. The "Electron" metal carried off the first prize. It contains about 90% of magnesium. Since that time one has not heard anything further of this metal and it is not to be had in the market. Its strength is said to be about 50,000 lbs. per sq. in. (36 kilos per sq. millimeter) and about 1.8 specific gravity. It is further stated that it will not resist the action of sea water, and whether it stands atmospheric influences is also to be doubted.

The second prize was awarded to a magnesium alloy manufactured by another firm, and of which nothing is known so far.

An aluminum alloy called "Duralumin" received the third prize. There is every indication that this alloy will become the favorite construction material for air-ships. It has been officially ascertained that its strength can be made 85,000 lbs. per sq. in. (60 kilos per sq. millimeter). Count Zeppelin has given an order for this material and an air-ship for the English Admiralty will be entirely constructed from it. Experiments have proved that its resistance to sea-water is sufficient to make its use at sea practicable. Cartridge cases for infantry guns are now being manufactured from it, and while possessing all the good points of the brass cartridge, they have the additional advantage of a lighter specific gravity. This specific gravity is only 2.8. The fact that Messrs. Vickers' Sons & Maxim of England have acquired the right to manufacture "Duralumin" in that country may be considered as a proof that the good reports of this new alloy must have a solid foundation.

Germany

Plating Tanks and How to Improve Them.

By S. G. W.

Twenty-five years ago, plating tanks were built of soft, white pine and the sides and bottom were each of one piece with a knot in them. When mortised and put together with white lead in the joints they would need little if any lining to keep them tight. Today, this quality of lumber is very high in price and exceedingly difficult to obtain. It has become so scarce that other woods have replaced it, and cypress is now the material most extensively employed for the manufacture of such tanks. It has practically replaced pine. It is not as satisfactory as pine, however, as the sides of a tank are usually made of two or three sections and they must be lined with coal tar pitch or asphaltum to prevent their leaking, and even then they frequently cause more or less trouble from leakage.

Plating tanks made from poor lumber, or old tanks that leak badly may be lined with wire-cloth tacked on 3/16 inch strips of wood nailed on the sides of the tank. These strips serve to raise the wire cloth away from the tank. Good cement is then plastered on the wire-gauze to a thickness of about ¾ of an inch. The cement should be made of a mixture of 2 parts of sand and 1 part of cement, mixed dry and then wet down until a stiff mass is produced that will adhere to the sides of the tank and the wire-cloth.

After drying thoroughly, it is advisable to give the cement a thin coating of hot, coal-tar pitch so as to render it water-proof. If desired, cheap cement tanks may be made by running the cement into molds, and if reinforced with wire cloth or expanded metal, it need not be over 2½ in. in thickness. Use the same mixture as previously given (2 parts of sand and 1 part of cement), but thin down with water until it can be poured. These tanks should also be lined with hot pitch after drying.

For hot cyanide solutions, such as those of copper, brass and bronze, tanks of boiler iron are the cheapest in the end as they will not rust when such solutions are used in them and will last for many years.

Rubber will remain in an elastic condition for a longer time if kept in a closed vessel away from the light

Blistering of Sterling-Silver During Annealing.

Silver has properties not possessed by any other metal. While it does not oxidize superficially during melting, it absorbs oxygen gas so that a solution is formed. Upon cooling in the casting, the silver evolves the oxygen again forming cavities known as blowholes, and when such silver is rolled, the cavities, on account of the gas they contain, swell during annealing and form blisters. Copper has properties very similar to silver as it does not oxidize during melting, but absorbs its own oxide together with gases. When cast, the gas forms cavities or blowholes, and when rolled and annealed these become blisters by the expansion of the gases therein. When silver and copper are alloyed to form sterling-silver, the absorbed gas acts identically the same as in the pure metals, or the copper or silver composing it. Upon cooling in the mold, the sterling-silver gives up the oxygen gas it has absorbed during the melting forming blowholes. When the casting is rolled these blowholes are compressed, and then, when annealing takes place the gas in them expands forming the well known blisters. *Blisters of this kind, which are caused by imperfect melting, must not be confused with those which form during the annealing of sterling-silver free from blowholes, and which are produced by overheating during the annealing.* It is the purpose of this article to show that, even with perfect sterling-silver, it is possible to produce blisters of the most flagrant nature by overheating it during annealing in an oxidizing atmosphere.

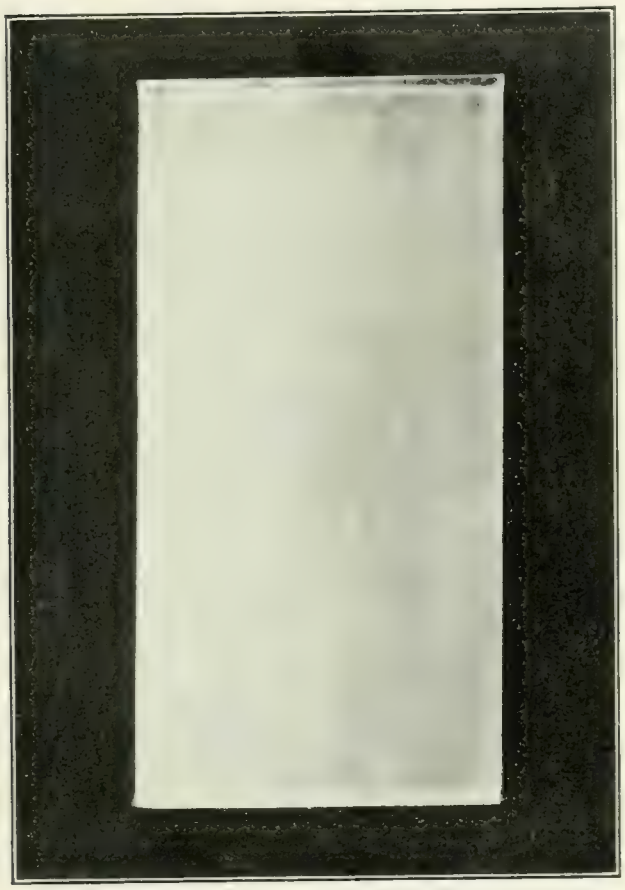


Fig. 1. Sterling-Silver Annealed at the Right Heat.

Fig. 2. Sterling-Silver Annealed at too High a Heat in an Oxidizing Atmosphere.

Production of Blisters During Annealing.

The fact that blisters can be produced during the annealing of sterling silver is not generally appreciated, and in the majority of instances the formation of such blisters is assumed to be the fault of the metal itself, and to have been caused by careless or imperfect melting. *Such an assumption is radically wrong as it is a simple matter to blister the*

most perfect sterling silver that can be made by heating it too hot during annealing and the use of an oxidizing flame or source of heat.

The following remarks have been made particularly with reference to the annealing of sterling-silver sheet metal or products made therefrom, as it is upon such sheet metal or sheet metal products that blistering so frequently occurs. Other forms of sterling-silver products, such as wire or tubing are used in such comparatively small quantities that they cause no appreciable trouble in this respect. The main difficulty, as far as the blistering of sterling-silver is concerned, is in the manufacture of flat-ware and hollow-ware.

In the manufacture of sterling-silver wares, two methods of annealing are used: First, by means of a muffle furnace. Second, by means of a blowpipe flame. The muffle furnace is used for annealing considerable quantities of goods at one time. The blowpipe is employed for annealing single articles or treating certain parts of an object so as to allow the remainder to remain hard. It is possible to produce blisters on the sterling-silver by either method.

Silver absorbs oxygen gas with energy when it reaches a certain temperature. The absorption begins to take place considerably below the melting point and just what the exact point is has never been determined, but it is believed that the absorption begins as soon as any oxidation sets in. Science would be benefitted if the exact temperature were known. At a low red heat there is very little absorption, but as the temperature begins to rise it increases until a point near the melting point of the sterling-silver is reached when it follows quite rapidly.

To indicate that sterling-silver may be blistered during annealing, two experiments were made in order to obtain examples for illustration. A piece of sterling-silver sheet, 2 x 6 x ⅛ in. was annealed at a medium red heat generally employed in the annealing of this metal. The annealing was done upon a sheet of asbestos by means of a gas blowpipe. Ordinary illuminating gas was used and an air blast was employed for producing the necessary pressure. When the sheet had been annealed at this temperature it was quenched in water and then pickled in a hot solution of sulphuric acid in water (1 part of strong acid and 9 parts of water.) When the oxide on the surface had been removed, the sheet was rinsed in water and then dried. No blisters were noticed. This sheet, after annealing in in such a manner is shown in Fig. 1. When this had been done, and no blisters were found, it became evident that the sterling-silver was good and free from blowholes which would cause blisters during an annealing. In this experiment, the sheet was annealed with a reducing flame (i. e. one that was slightly smoky.) The experiment was now tried of heating the sheet still hotter in the reducing flame and practically the same temperature was employed as that in the following experiment in which blistering took place. A smoky or reducing flame was used and the silver did not blister. When pickled and dried it had the appearance shown in Fig. 1. It became evident, then, that sterling-silver cannot be blistered when a reducing flame is used during the annealing.

In order to ascertain the effect of an oxidizing flame during the annealing, the same sheet of sterling-silver was annealed in the manner followed in the previous experiments, but a flame was used and as large an excess of air as possible. When the annealing took place at a medium red heat such as employed in the first annealing of the silver with a reducing flame, the sheet did not blister. Raising the heat to a higher amount beyond that which would be employed in good practice, and employing the strong oxidizing flame, blisters began to form rapidly on the surface of the sheet. When quenched in water and pickled the appearance of the sheet was that shown in Fig. 2. It will be noticed that the surface is badly blistered and more so, perhaps, than would ever be found in actual practice, but the principle is the same whether the blisters are large or small, or few or numerous.

The blisters shown in Fig. 2 were covered with a thin skin which could easily be punctured. The cause, of course, was the absorption of oxygen gas which was first absorbed superficially and then given out again on cooling. It is evident, therefore, that when sterling-silver is annealed at too high a temperature with an oxidizing temperature that blisters will form on the surface. Some one has termed them "heat blisters" in contradistinction to those which are produced by blowholes in the casting before rolling, and it is a suitable name for them.

In making aluminum castings the sand should be rammed as soft as possible to allow the shrinkage of the metal in cooling to take place without rupture of the casting.

Softening Rust Before Pickling.

By A. C. Stillson.

The plating of rusty iron or steel is a very unsatisfactory job and platers try to shun it wherever possible. If it is possible to polish off the rust on a wheel, then the matter is not so troublesome, but if it is impossible to remove the rust in any manner other than pickling then one will have to take his chance in removing it to the best possible advantage. In many instances even with polishing all the rust cannot be removed as a wheel may not be able to reach backgrounds or corners. Then pickling must be resorted to in addition to polishing. While I do not advocate the plating of rusty articles, a plater must, of course, do it when such work is brought to him.

I recently had some articles made of stamped tin plate sent to me for copper plating. The character of the articles may be seen by referring to the illustration. These articles are badly rusted so that many of them stuck together. It was thought that copper plating them would be cheaper than purchasing new ones. As it frequently happens that the surface of iron or steel that has been badly rusted will be so badly pitted after pickling on account of the action of the rust, I ascertained by treating a few that when the rust was removed the metal was not so badly pitted but that it could be used. My customer stated that it would be all right to go ahead.

I discovered by accident that if the articles were allowed to soak in a strong, hot potash or caustic soda solution for fifteen or twenty minutes, the rust was softened so that it easily pickled off and with very much less time than when not treated with this solution. In the pickling of rusty objects the metal as well as the rust is attacked so that the length of time consumed in pickling is important. A short time is advantageous as it allows the removal of the rust with the minimum attacking of the iron or steel.

The articles which I had to plate and which are shown in the illustration, contained more or less printer's ink on them and where this had dried on no rusting occurred. I saw at once that a soaking in strong potash would be necessary to remove the ink so I made up a new and strong solution and allowed the tin frames to soak in it for about half an hour When removed I was surprised to find that the rust had softened to some extent. I next pickled them in a muriatic pickle composed of 2 parts of water and 1 part of acid. This was used cold. I was surprised to find how rapidly the rust was removed. In a few minutes it was all taken off and the metal was apparently attacked but very little. It was apparent that the previous soaking in the strong, hot potash solution was the cause of this rapid pickling.

In order to ascertain the difference between the rapidity of pickling when the tin frames had been potashed and pickling without such treatment, two batches were used. The first

The Rusted Tin Frames.

was pickled in the muriatic acid pickle without treating with the potash solution. The second batch was soaked in a strong, hot potash solution for half an hour and then rinsed in cold water and pickled. New acid was made up and identically the same strength used for each batch. The pickling was done cold. The following results were obtained:

Relative Time of Pickling to Remove Rust.

Potashed	4 minutes
Not Potashed	65 minutes

The treatment in the potash solution seems to act on the rust and change its character. There is apparently a chemical reaction set up so that by changing the character of the rust

it is softened and made easily soluble. That this is the case was apparent by the appearance of the rust after it came from the potash kettle as it was black and soft so that it could be almost rubbed off with the hand.

Those who have occasion to plate or pickle rusty iron or steel should first allow it to soak in a strong and hot solution of either caustic potash or caustic soda. The length of time required in pickling will then be very much reduced and the rust removed more efficaciously. The rapid removal of the rust prevents the metal itself from being attacked to any great extent.

I may add that the frames after pickling plated without good results and in trying those which were and were not potashed previous to pickling, it was found that the potashed frames had a much smoother surface after copper plating. This was, without doubt, occasioned by the small action of the acid during pickling upon the metal itself.

Whitening Articles by Simple Immersion.

By Thomas B. Haddow, Jr.

This process is intended for coating small articles, such as hooks and eyes, pins, buttons, etc., made of copper and brass. The whitening may be done in quantities and at a low cost.

To produce the best results, the bath should be prepared with care and kept free from contamination with foreign matter. To prepare it take 2 oz. of fine silver (preferably in grain form) and dissolve it in nitric acid. This solution of nitrate of silver is next added to 1 gallon of distilled water and a strong solution of common salt poured in. This will precipitate the silver in the form of chloride. This precipitate is then washed in a thorough manner to remove all traces of acid, and the last rinse water should be tested with blue litmus paper to make sure that all the acid is removed.

The chloride of silver thus formed is next mixed with an equal amount of cream of tartar (potassium bi-tartrate) and sufficient water to form a mass of the consistency of cream. The articles, after having been thoroughly cleaned or dipped, are immersed and stirred about until they are sufficiently white, when they are rinsed in hot water and shaken up in sawdust to dry.

Metallic Radium at Last Produced.

While many persons have believed that the so called "radium" which has been produced in the past, and which has commanded such fabulous prices, is the pure metal, as a matter of fact radium salts only have been obtained and these are the materials that have been placed on the market for experimental purposes and for the treatment of disease. The announcement is now made that Mme. Curie, who with her late husband, discovered the existence of radium, in conjunction with Prof. Dubiern, has succeeded in producing pure metallic radium. This announcement is of great interest.

As obtained, the metallic radium is a white metal that rapidly oxidizes when exposed to the air. When thus exposed it instantly becomes black. The amount of metallic radium produced by these investigators was quite small as only 1/100 of a grain of radium salts was used for its production. When the metallic radium was placed on an iron surface it adhered to it tenaciously. Placed on paper it set fire to it. Water is also decomposed by it.

Use of Iron Bells in Olden Times.

Dr. Otto Vogel has an interesting note on iron bells. The oldest description of bells he remarks, was of sheet iron, specimens of this kind of bell being still found in considerable number in Ireland. In Germany the only known specimen now extant formerly hung in St. Cecelia's at Cologne, and is now in the Wallfram Museum of that town. The bell in question is said to date from 613, and was called the "Saufang," or the "Swine's Catch," because it was dug up, according to tradition, in the "Peter's Pool" in Cologne by a pig. Another iron bell, the "Columbus Bell," is found at St. Gall in Switzerland. Hemispherical cast-iron bells, dating from the second half of the fifteenth century, are found at Wilpartig, Ascherung Tressling, and Pullach in Bavaria. From the seventeenth century onwards cast-iron bells were more frequently used, the principal casting places being in Bern, Berlin, and Vienna. They were replicas of the bronze bells, but less melodious and harsher in tone. Most of these bells have now succumbed to the action of rust.—*Stahl und Eisen.*

Linotype, Monotype, Stereotype and Electrotype Metals and Their Manufacture.

The introduction of typesetting machines and the extensive employment of stereotyping and electrotyping, have created a demand for the various metals used in these trades that has to be met by soft metal makers. When it comes to the use of new metals in making the various mixtures, if a maker adheres to the best formulas (as he should or the consumer will soon find it out), it is safe to assume that the only way in which one manufacturer can undersell another is in purchasing his metals

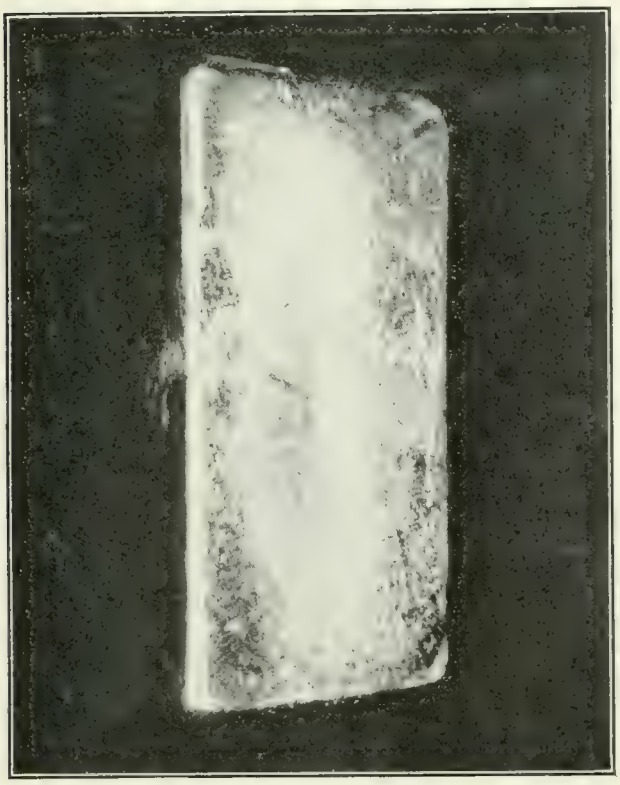


Fig. 1. Top of a Bar of Electrotype Metal Made from New Metals. Poured at Right Heat.

at a lower price. Like the making of solder and babbitt-metals, scrap metals have now entered extensively into the manufacture of the various "type" metals, so that a large number of makers now supply the market with this grade of goods. In many instances, the use of scrap metals cannot be condemned, but it requires much experience and knowledge on the part of the maker. As far as the question is concerned: Are "type" metals made from scrap as good as those made from new metals? let it be said that the answer can best be given by saying that "the proof of the pudding is in the eating," and if the results are satisfactory, then scrap is as good as new metal. This is rarely so, however, and the only reason for using the scrap is its low cost. There are many instances, of course, where cost is an important item, and were it not, scrap metals would never be used. For uniformity, running qualities and adherence to the necessary mixture, new metals always give the best results. In justice to the makers of scrap metal products, it may be said that large quantities of "type" metals are now annually made from scrap materials, and must give good satisfaction otherwise the industry would not flourish.

Linotype, monotype, stereotype and electrotype metals are all composed of lead, antimony and tin.* The only difference is in the slight change in the proportion of the various ingredients. It would at first seem that so slight a change would hardly call for the use of different mixtures, but it has been found that they are quite necessary. Although the mixtures vary slightly, the method of making them is the same.

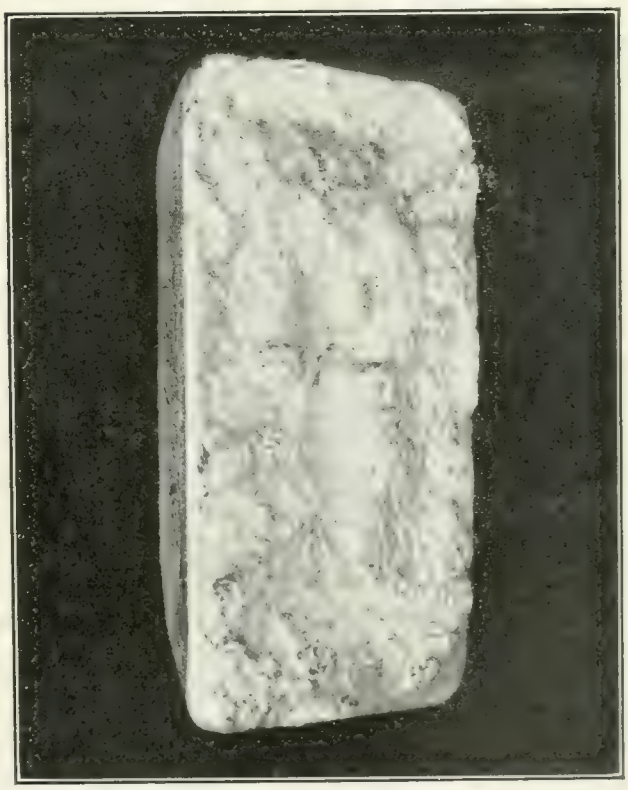


Fig. 2 Top of a Bar of Electrotype Metal Containing Zinc.

Making from New Metals.

As antimony melts at nearly a red heat, it is unwise to place the three metals in the melting

* For the mixtures used in them see THE BRASS WORLD, June 1910, page 205.

pot together and melt them as this usually results in the "burning" of the whole mixture. Place the antimony with an equal quantity of lead in the bottom of the pot and heat until melted. Then add the tin and the remainder of the lead. In this manner overheating is avoided. When the whole is melted, stir well to mix and then throw on a few ounces of rosin. When this has covered the surface and acted upon the oxide, skim well and the metal is ready for pouring. Pour at as low a heat as possible.

The preceding directions are all that will be required in making the various mixtures from new metals. The purer the metals, however, the better the mixture so that if one desires to make the highest quality of "type" metals, then he will have to employ the purest metals as the ingredients.

Making from Old Metals.

The making of "type" metals from old or scrap metals is a matter that requires much care and experience. The ideal way to do it, but one never carried out in practice would be to accumulate a large quantity of the various scrap metals to be used in making a certain mixture, and melt them together in a large batch. Then pour into bars and have a chemical analysis made. By means of such an analysis it would be possible to make the standard mixture.

The making of "type" metals from scrap is beset with two difficulties:

1. The presence of impurities, such as zinc, brass or aluminum.

2. The presence of oxide which renders the metal thick and more or less pasty.

One of the most objectionable is zinc. It is such a common metal and is so extensively used, that it finds its way into scrap in large amounts. If it is present in the scrap in individual pieces, careful hand picking will remove it; but if it is present in the metal itself, then it is quite a task entirely to eliminate it. Melting and constantly skimming after throwing a small quantity of sal-ammoniac on the surface will finally eliminate most of it, but to remove the last traces is extremely difficult. In Fig. 2 is shown the top of an ingot or bar of electrotype metal which contains a large amount of zinc. The extensive use of zinc cuts and the contamination of the electrotype metal scrap or dross with the routings, are responsible for the constant entrance of the zinc into electrotype metal. In Fig. 2 is shown a bar of electrotype metal made from new metals. This is the way good metal should look.

The presence of oxide in the metal is the cause of the thick quality of the mixture. One would naturally think that the oxide, being lighter than the metal itself, would float to the top, but such is not always the case. Some of the oxide will do so, but another portion remains entangled in the metal itself. This will gradually float to the top, but it will take some time and the best method is to use a stick of green wood in the bottom of the kettle. Force it down by means of an iron rod and allow the gases from it to bubble up through the metal. In half an hour or so it will be found that the oxide has been reduced and a much more fluid metal obtained. Now skim off the metal as considerable dross will have formed. Then throw a small quantity of rosin on the surface, allow to cover the entire surface of the kettle and skim again. The metal if of the right mixture, is then ready for pouring.

As previously mentioned, the making of "type" metals by analyzing the various ingredients is not practised. The maker usually judges the mixture by his eye, and by a few simple tests, such as bending or breaking a small bar. The fracture of the metal also indicates whether the right mixture has been obtained. It is in this operation that experience is needed, and it is surprising how closely a maker who is adept in the art can come to the right proportions. The necessary fluidity of the metal is ascertained by the manner in which the metal runs into the mold.

Among scrap metals, the chief source from which the "type" metals are made are babbitt-metal scrap, old solder, old electrotypes, block-tin pipe, old lead pipe, antimonial lead castings, pewter, britannia-metal goods, etc. If the maker is a dross smelter, he also obtains metal from the drosses of the aforesaid metals. If care is used in making the mixture and freeing the metals from zinc and other foreign metals together with the oxide, very good mixtures can be obtained and which will usually answer in the majority of instances.

It is worthy of note that among the users of "type" metals, there are some who do not require the highest quality. For example, in linotype metal, the daily newspapers, as a usual rule, do not require a very hard mixture. They do not print from the linotype

metal, but make a stereotype form from it and from which the printing is done. As long as the linotype metal, therefore, casts well nothing more is really required. It is for this reason that newspapers do not use the best grade of linotype metal. In the case of printers who print from the linotype metal direct, and who desire the best possible impression that will be as near that of type as possible, the use of a mixture made of entirely new metals is advocated as this will always give the most satisfactory results. It will readily be understood, therefore, that scrap metal products may be adapted to the case so that satisfaction will be obtained in using the scrap metal mixture.

Making Russian Samovars.*

The manufacture of samovars in the Government of Perm is the largest and most important home industry. There are about 30 small establishments devoted to this industry, each equipped with about a dozen turning lathes and a simple forge. The annual output of these workshops aggregates 40,000 samovars. The brass and covers are purchased at Moscow, the chimneys are forged, and the bodies of the samovars are pressed out of sheet iron. These parts are soldered and turned, whereupon the brass handles and feet are fastened on, these latter parts being cast in special shops devoted to the casting of such accessories.

The wages paid to laborers per day are as follows: Turners, 2.50 to 3.50 rubles ($1.29 to $1.80) founders, 2 to 3 rubles ($1.03 to $1.54); solderers, pressers, and smiths, 1 to 2 rubles ($0.51 to $1.03).

The samovar (self-boiler), the name under which the Russian "tea machine" is known, is a most practical apparatus, with a charcoal heater for keeping water boiling on the table for tea. Its form is very graceful, and it is an indispensable article in every Russian household. A medium-size samovar retails, if of brass or nickeled, for about $5 to $8, including tray and small bowl. Silvered and engraved samovars command high prices, according to workmanship.

*Hernando do Soto, U. S. Consul at Riga, Russia, in the *Daily Consular and Trade Report.*

The Use of Lacquer from a Salesman's Point of View.

By Frank P. Davis.

The manufacturer who uses lacquer and who has not had trouble with it, is either new in business, or fortune-favored. The longer he has been in business and the more trouble he has had with lacquer, the more prone he is to lay every trouble he has with it directly to the quality, and the less liable he is to search for the cause elsewhere. This is speaking generally. The exception proves the rule.

Every time trouble occurs the salesman is sent for posthaste and greeted with the statement that the lacquer has gone wrong. The fact that it is greatly to the lacquer manufacturers' advantage to maintain a uniform grade of output, that the product is made up in large quantities, and all customers of a grade served from the same stock, and that none of the other customers have made complaint makes a good argument from the salesman's point of view, but it falls flat on the ears of the user in trouble. He expects something of the kind—considers it part of the salesman's stock-in-trade. Something must be done and done soon. Perhaps the following experience in the day's work of the writer may point a way:

A manufacturer of small fancy ferrules made of low brass had trouble with his lacquer, and to prove it sent in a quantity of lacquered work that was certainly off color. The statement accompanied them that they were all right before they were lacquered, hence the lacquer was at fault for the discoloration took place in a day or two. Now the fact of the matter is that if the lacquer contained any disturbing element the discoloration would take place immediately, so some unlacquered work was sent for. It came in due time with the courteous request to note how bright they were before being lacquered.

They arrived about the color of an ordinary copper coin that has been in circulation some time. Evidently they had not been thoroughly washed free from the acid in which they had been brightened. Part of these were hustled out to a job shop where they were properly acid dipped and part of these lacquered, the whole lot was then sent back marked "Exhibits A. B. & C." and the incident was closed.

Another manufacturer makes large quantities of a small article made of tin, brass plated

and colored up by buffing. His lacquer "went bad." Investigation showed that he was using a cheap grade of buffing compound. An analysis of this material showed it to contain mineral oil and wax, instead of tallow. The soap solution in which the work was washed after buffing did not remove it, for mineral oil will not saponify. The lacquer solvents cut this off, consequently in a few days the lacquer contained enough oil in solution to prevent adhesion. When this was thoroughly demonstrated, then there was another satisfied customer.

Another case: The product is a small article made of sheet brass, parts of which are finished by silver plating, and parts are brass, which are blackened by a corrosive dip. They are made up and finished and lacquered in sheets and then cut out, and last of all, bent to shape. 50,000 were made up and in the last operation of bending the lacquer came off, taking the black with it. The trouble was coincident with the first use of my product, consequently the trouble was laid to the lacquer. Investigation showed that for the first time in the use of the black corrosive dip something was the matter with it, and that the black deposit would peel off in bending before lacquering, as well as afterward.

One more case: The product is an immense output of small pieces made of brass, polished and of steel brass plated and polished. A large stock of finished work had discolored and the lacquer was curling up and falling off. Another case of poor lacquer. The user was careful to properly clean all work in benzine before lacquering. It took some time to discover that the benzine tank was never cleaned out, but that new lots were added as required, and that the accumulated oil from the work had produced a mixture that was far from being entirely volatile. The fact was also brought out that the machinists were in the habit of washing their greasy hands in the benzine tank. After this the remedy was obvious.

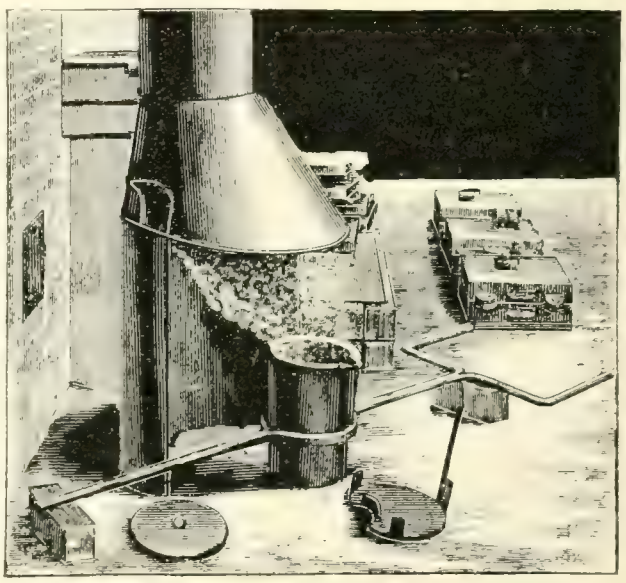
If you have trouble with your lacquer, make a thorough investigation. If the trouble remains, send for the lacquer salesman—he may be able to help you.

To prevent fire-cracks in coiled brass rods during the annealing, the ends are bent to an angle of about 90 degrees before the rods are placed in the muffle.

A Cover for Use in Pouring from Crucibles.

In England much has been done in the endeavor to purify the atmosphere of brass foundries from the zinc fumes that are always present to a greater or less extent when brass is melted. Laws have been passed regulating the method of ventilating foundries, and many attempts have been made to utilize certain inventions for preventing the escape of the oxide of zinc into the air.

A new device has recently appeared in England for preventing the escape of the zinc fumes. It is made by Wm. Ross & Sons, Glasgow, Scotland and we are indebted to *The Ironmonger* for the information contained herein. The device used is a cover for placing over the top of the crucible and is shown on the floor of the illustration. When the crucible is removed from the furnace, the cover is placed over it and the escape of the zinc fumes is prevented. The only amount that escapes is that which forms during the pouring of the brass. It is claimed that the cover reduces the zinc loss from 80 to 90 per-cent. No extra labor is required of the workmen. Messrs. Wm. Ross & Sons have applied the cover to their own brass foundry and have used it with excellent success. It is stated that the cover is patented. According to the claims made for the cover, the melting loss on yellow brass should be reduced by employing it.



Crucible Cover for Preventing Escape of Zinc Fumes.

Chromax-Bronze and Its Properties.

A short time ago, James Naulty and John Scanlin of Philadelphia, Pa., discovered that when chromium is introduced into nickel alloys, some very marked and valuable properties are imparted to them. It was found that if about 5 per cent of chromium is added to an alloy of copper, nickel and zinc, not only is a strong and non-corrosive mixture obtained, but one which will take an edge sufficient for cutting tools. This alloy proved so satisfactory that a patent upon it was granted to the aforesaid discoverers and a company was formed to produce it. It has been given the trade designation of "Chromax-Bronze."

The alloy is made from pure metallic chromium and the actual method of introducing it is maintained as one of the trade secrets of the company. This company appears to have done quite well, however, and some very creditable examples of work are herewith shown. These were all made at the works of the company, and show the adaptability of the metal.

Chromium not only imparts hardness to the alloy, but strength as well. In addition it gives the metal non-corrosive properties. In Fig. 1 are shown a variety of articles made from the bronze. The razor and table knife were forged from bars of the metal in the same manner that steel is worked. The razor takes a cutting edge sufficient for shaving. The table knife may be used with results equal to those obtained with steel, and at the same time, there is no danger of rusting.

The castings shown in Fig. 1 were made in green sand in the manner followed in making ordinary brass castings, except that a higher heat is necessary in pouring. The color of the metal is white and when cast, the surface of the castings, when they are taken from the sand, are smooth and clean. The stiffness of the metal is at once apparent to those who are accustomed to brass castings.

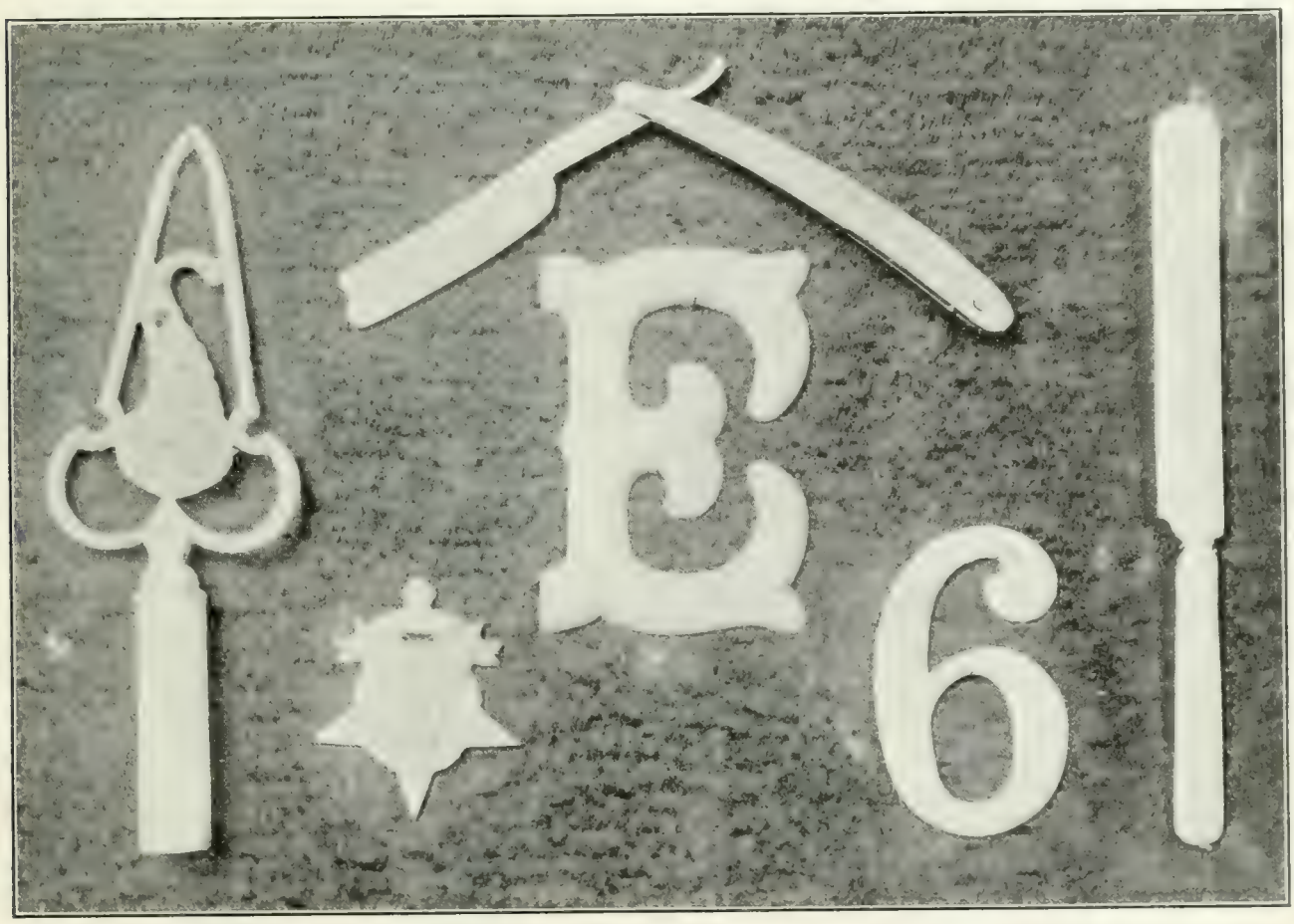


Fig. 1. Examples of "Chromax" Bronze, Both Forged and Cast in Sand.

The inventors state that the following properties are peculiar to the bronze:

"It is white and takes a high polish. Its toughness is that of cold-rolled shafting.

It resists the action of acids to a marked

degree. A number of large woolen mills, which experienced difficulty from the action of acid on their phosphor-bronze and brass bearings, have now adopted it for this purpose.

Salt water has practically no effect upon it. It has been found excellent for gears. The atmosphere does not corrode or tarnish it. For use in ornamental work, such as, for example, those shown in the articles illustrated in Fig. 1, it is well adapted as it is a solid metal and there is nothing to wear off.

Tests of sand castings showed a tensile strength of 78,950 lbs. per sq. in."

Fig. 2. Bearing Made from "Chromax" Bronze.

The following report of the properties of the alloy as a bearing metal was submitted to the makers by John H. Townsend, superintendent of the Chester Engineering & Machine Co., of Chester, Pa., makers of automobile motors:

"After a test run of 63 hours under a brake load of 29.87 H. P., motor running 1750 revolutions per minute, the motor was taken down and the bushings examined and found perfect. The wear could not have been more than 0.0005 of an inch. The motor was then re-assembled and run continuously for 300 hours under a brake load of 29.08 H. P. average. The motor was then taken down and the bearings removed. All the bearings had worn very smooth and had a high polish. In measuring them for wear, there was only a variation of 0.001 of an inch. This complete running test consisted of 363 actual running hours. The length of bearing was 1¾ inch. diameter of bore 1 inch, the shaft was of cold rolled steel and the wear upon it averaged 0.0005 of an inch. The weight on the bearing was 30 lbs., that is the valve springs weighed 30 lbs. on a quarter inch lift. The springs were made particularly for this test and running 1750 revolutions per minute caused 7000 blows on the bearings per minute or 420,000 per hour or 152,460,000 in 363 hours. The bearing under this test proved remarkable.

I made one connecting rod bearing with 1½ inch bore for the crank pin, then placed the bearing on the connecting rod and put the rod on a hardened and ground mandrel between centers running 800 revolutions per minute. The cap was then tightened on the mandrel until 120 lbs. were shown on the scale. The scale with this pull of 120 lbs. was run continuously at 800 revolutions per minute for 12 hours. It was then taken apart and examined. The bearing seemed perfect and had taken a very high polish and showed no tendency to cut or mar the pin, or to heat above the normal temperature. The bearings were all mechanically oiled.

It was found that the bronze must be worked with high speed steels in turning or machining, if economy of production is desired. As a bearing metal, I believe this bronze to be the best I have used for this purpose."

The bronze is now being manufactured by the Naulty Smelting & Refining Co., Ltd., 2616 Martha St., Philadelphia, Pa.

The Return of Brass Cannon.

The following item from an English trade publication would seem to indicate that the era of brass cannon has returned:

The largest brass gun ever made in England was cast on July 13 last in a successful manner at the Royal gun factories, Woolwich Arsenal,under the direction of Mr. Anderson, assistant superintendent of the department. Upwards of 11 tons of metal were used in the casting, and the gun mould with the deadhead was 20 ft. in depth. This immense piece of ordnance is to be rifled on the muzzle-loading principle, and is intended for experimental trials at the school of gunnery, Shoeburyness, in competition with rifled guns made from steel or cast and wrought iron.

New Appliances of the Monarch Engineering & Mfg. Co.

The Monarch Engineering & Mfg. Co., of Baltimore, Md., manufacturers of the "Steele-Harvey" tilting, oil-burning crucible furnace and a large number of other oil burning furnaces and similar appliances, have recently placed on the market some new oil burning appliances that are worthy of the attention of every metal manufacturer. These appliances are herewith illustrated.

Core-Oven Utilizing Waste Heat.

A novel combination of melting furnace and core-oven, in which the waste heat of the furnace is utilized in heating the core-oven, has been constructed. This furnace combination is in Figs. 1 and 2. The furnace shown is the improved Steele-Harvey type and in which metal is melted in crucibles by means of oil or gas. Either kind of fuel may be used. In melting, there is always a large amount of heat wasted and it occurred to the company to utilize the waste for heating a core-oven. The result is the combination shown in Figs. 1 and 2. The well known core-oven manufactured by them and which has given so much satisfaction is used with the furnace.

It will readily be appreciated that such a combination means great economy. The cores may be dried without any cost whatever as the waste heat from the melting furnace only is employed for the baking

Ladle Heater.

In pouring from tilting furnaces, it is necessary to use a ladle or crucible into which the metal can be poured from the furnace, and then into the molds. Some founders use a ladle and others a crucible. For large quantities, the ladle will probably be found cheaper as there is less danger of breakage. The Monarch Engineering & Mfg. Co. of Balti-

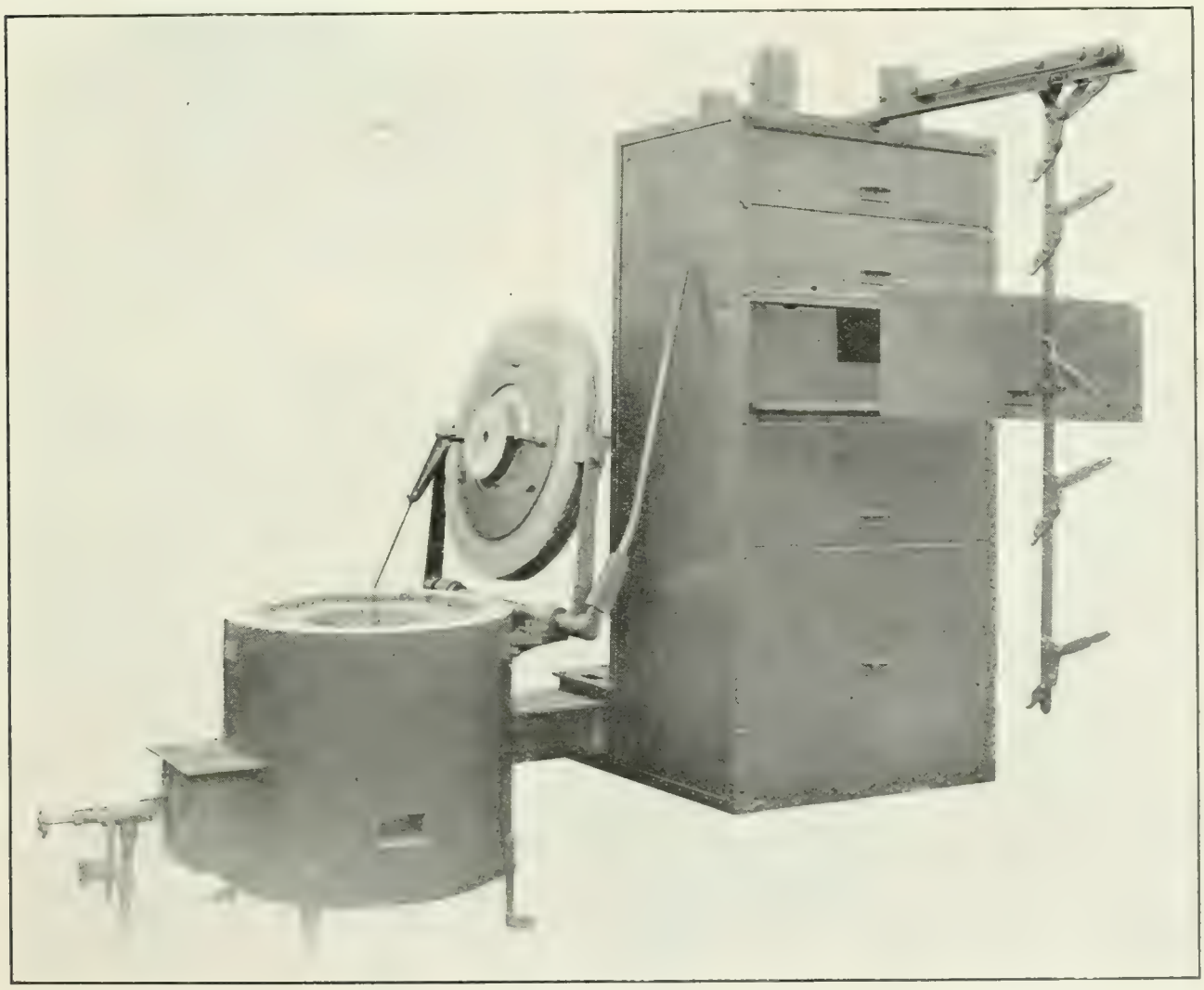


Fig. 1. Steele-Harvey Brass Melting Furnace in Which the Waste Heat is Utilized for Heating a Core Oven.

more, Md., have constructed a new form of ladle heater for use in drying the ladle or crucible used with a tilting furnace. The heater is shown in Fig. 3. The ladle or crucible is placed under it and the oil flame lighted. A large slab of fire brick over it prevents the escape of heat to the burner. The drying takes place rapidly and effectively. A feature of the heater is that the ladle or crucible may be heated to a high temperature and not simply dried as it has been found that much better results may be obtained when it is heated quite hot. The metal from the furnace then does chill when poured into it, and there is little danger from the loss of small or thin castings from cold metal. It has been found that many brass founders making small castings, and who have had the idea that a tilting furnace could not be used, have discovered that the fault lay in not having the ladle hot enough when the metal was poured into it. By the use of this ladle heater, however, it is possible to have as hot metal for pouring into the molds as though it were melted in small crucibles direct.

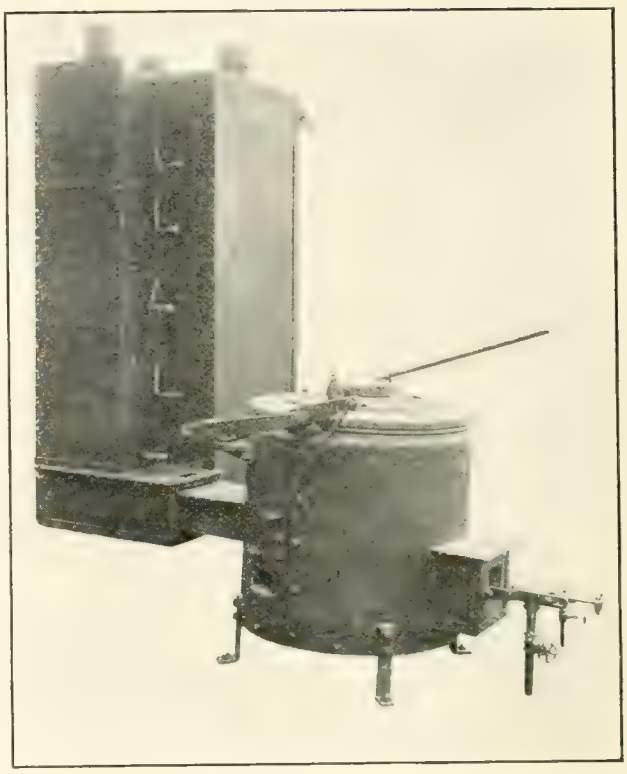


Fig. 2. Rear View of Combination Furnace Utilizing Waste Heat.

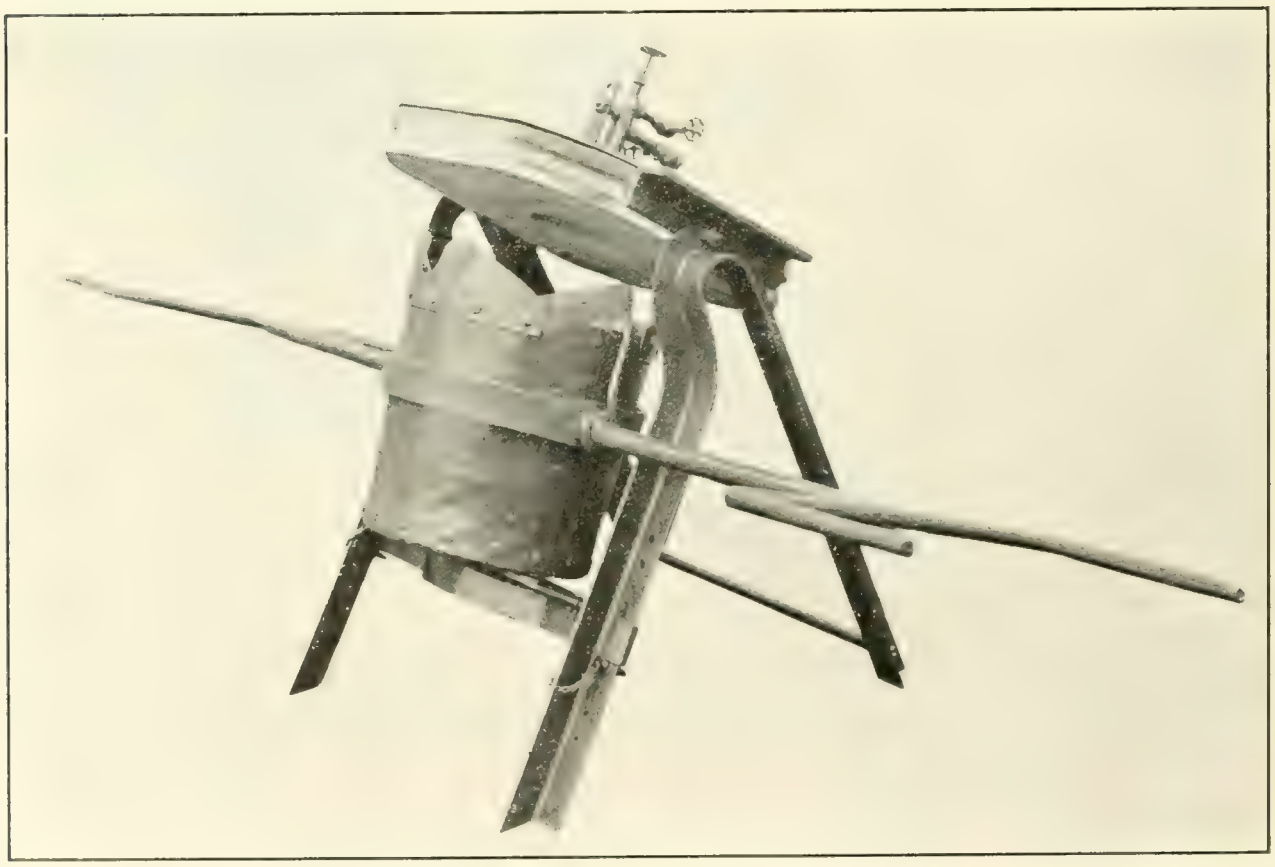


Fig. 3. New Form of Ladle Heater Recently Placed on the Market by the Monarch Engineering & Mfg. Co., Baltimore, Md.

The Determination of Aluminum in Brass and Bronze.

By Albert J. Hall and C. W. Dillon.*

Very little work has been published upon the determination of aluminum in brass and it is thought that little work has been done upon it, for its presence even in minute quantities has such a deleterious effect on red brass that samples containing it have been promptly rejected. However, when it was deemed advisable to determine the amount present, the usual method of determining it as the oxide together with iron present, proved unsatisfactory. It was found that the personal errors were often as great as the amount of aluminum present. The phosphate method, however, seems to have given very reliable results. No originality of method is claimed, but it is hoped that the following details may render some assistance to those who are called upon to make an occasional determination.

Weigh accurately 3 grams of the sample, freed from metallic iron, into a 300 c.c. Erlenmeyer flask. Dissolve in 25 c.c. aqua regia. Evaporate to dryness, take up in a little water and 7 c.c. conc. hydrochloric acid, heat until solution is clear and dilute to 250 c.c. Heat the solution to about 90° C. and precipitate all second group metals present, by means of hydrogen sulphide. Filter through a small funnel and wash three times with hot water. Transfer the filtrate to a 600 c.c. beaker and boil until all the hydrogen sulphide is expelled. Add a few drops of conc. nitric acid, boil to oxidize any iron present, then add 2 or 3 grams of ammonium chloride and then ammonia until the solution is strongly alkaline. Boil until all free ammonia is expelled, then filter off the hydroxides of iron and aluminum, and wash with a 3% solution of ammonium nitrate. This precipitation, in the presence of ammonium chloride, separates practically all the zinc which otherwise would tend to come down with the aluminum, if a phosphate precipitation was made without the hydroxide separation. Transfer the precipitate and paper to a 150 c.c. beaker and boil two or three minutes with about 50 c.c. hydrochloric acid 1:1. Filter into a 600 c. c. beaker, wash several times with hot water and dilute to 400 c.c.

*Detroit, Mich.

To the cold solution, add 30 c.c. of a 10% ammonium phosphate solution, then ammonia until a very faint precipitate forms. Add hydrochloric acid until the solution is clear, being careful not to add too much acid, 1.5 c.c. usually being sufficient. To the clear solution obtained add 50 c.c. of a 20% sodium thiosulphate solution and heat to a boiling. Then add 8 c.c. conc. acetic acid and 15 c.c. of a 20% solution of ammonium acetate, and boil 30 to 40 minutes. Upon adding the thiosulphate solution a milky white precipitate is formed which upon the addition of the acetic acid and ammonium acetate and upon continued boiling, gradually becomes yellow and granular. Allow the precipitate to settle, filter and wash with hot water. Transfer it to a 150 c.c. beaker, boil with 50 c. c. 1:1 hydrochloric acid 2 or 3 minutes, filter and repeat the precipitation as a phosphate. Filter, wash, ignite and weigh as aluminum phosphate. Calculate as aluminum.

All of the phosphate precipitate will not dissolve as the greater portion of it is sulphur. The second precipitation as a phosphate gives a precipitate free from any traces of iron or zinc carried down mechanically in the first precipitation. This method is based upon the fact that when aluminum is precipitated as a phosphate in a weak acid solution its separation from the iron is complete, the iron being reduced and held in solution by the addition of the thiosulphate. If very little iron is present one precipitation has been found to give very good results.

By careful manipulation of this method checks within a few thousandths of a per-cent have been obtained.

The "Spotting-Out" of Plated Work.

Although the "spotting-out" of plated work is one of the exasperating things that occur in the plating trade, its cause is now quite well understood and the remedy is not difficult.

The spotting-out is caused by the presence of imperfections in the metal that is plated. Rolled metals are rarely subject to it unless in the joints, but castings are rarely obtained that will not show it under the right conditions. Blowholes, shrinkage-cracks, spots, dross or slag all act alike in the production of the spotting-out difficulty. In these cavities, so to speak, the plating solution finds its way, and the rinsing that is given the plated goods

after the completion of the plating is usually not sufficient to remove it. When the goods are finished, the solution gradually works out and spots the surface of the electrodeposit (hence the name of spotting-out).

The spotting-out is quite strong in the case of articles plated in cyanide solutions, as the potassium cyanide in it, being deliquescent (i. e. having the property of absorbing water from the air and becoming liquid) will not dry up; but, on the other hand, will become liquid so that there is a constant tendency to spread or increase in volume. In particularly obstinate cases of spotting-out, it has been found that the use of sodium cyanide in place of potassium cyanide in the plating solution will give more satisfactory results. As well known, sodium cyanide is not deliquescent and has a tendency to dry up. The use of sodium cyanide is to be recommended in cases where great difficulty is experienced in overcoming the spotting-out.

The most satisfactory manner of overcoming bad cases of spotting-out, is to allow the plated goods to remain several days or longer and then, after the solution in the cavities has had ample time to work out, to buff or dip the work. The method is based upon the fact that after the solution has had the opportunity to work out, it will do no further harm.

In many cases of spotting-out, it has been found that a prolonged soaking in hot water will remove the solution from the pores. The usual quick rinsing that is given plated work after it comes from the plating tank, has been found to be quite insufficient for the removal of the plating solution from the cavities or pores in the metal.

Spotting-out may also occur when blisters form on the deposit. This is a special variety of spotting-out, although one not generally realized or appreciated. It may occur on all kinds of metals whether the metal is porous or not.

Liver of sulphur solutions for oxidizing copper or silver should be freshly made from time to time. They rapidly decompose, particularly during hot weather.

According to Consul Wakefield, the monthly output of the silver mines at Cobalt, Ontario, is over $1,000,000. For the first six months in 1910, the shipments aggregated $6,750,000.

Effect of Sodium Bi-Sulphite on Cyanide Solutions.

Laboratory Experiments.

The use of sodium bi-sulphite in the electroplating industry is more or less extensive. It is used in cyanide copper solutions, in brass and gold plating baths. The object is to produce an even and clean electrodeposit. It seems to prevent the deposition of basic salts. When used in a cyanide copper solution, for example, it prevents the formation of a dark-red deposit and gives one that is clean and of the true copper color. Sodium bi-sulphite can hardly be called a "brightener" in the full meaning of the term. A better name for it would be a "cleaner."

The quantity usually employed in a brass or copper solution is from 1 to 2 oz. per gallon. The quantity need not be exact. While the same effect is obtained by the use of sodium sulphite (normal sodium sulphite), it is customary to use the sodium bi-sulphite on account of its less cost. It is less expensive to manufacture the sodium bi-sulphite than the sodium sulphite. The customary method of making it is to pass fumes from burning sulphur (sulphurous acid gas) into a solution of sal-soda until it smells strongly of the gas, thus indicating that an excess is obtained. The bi-sulphite, of course, indicates that there is an excess of the sulphurous acid. To make the normal sodium sulphite it is necessary to stop the action of the sulphurous acid gas when the neutral point is obtained. This requires considerable care. When the solution has been made, either in the case of the bisulphite or the normal sulphite, it is evaporated down to dryness to produce the solid salt.

As sodium bi-sulphite is an acid salt, it has the property of neutralizing alkalies. On this account it will neutralize a certain amount of free cyanide in a cyanide plating solution and alter the balance of it. It undoubtedly has been noticed by some platers that, when sodium bi-sulphite is added to a copper or brass solution, the anodes begin to coat over. This is caused by the partial neutralization of the free cyanide by the sodium bi-sulphite. In order to offset this obstacle it is necessary to add more free cyanide. This difficulty is noticed particularly in solutions where the free cyanide is kept down to the lowest possible amount. The addition of sodium bi-sulphite, in such a

case, reduces the amount of free cyanide with the result that there is not a sufficient quantity left to prevent the anodes from coating over.

In order to determine the amount of cyanide that commercial bi-sulphite of soda will neutralize the following experiment was made:

A 10% solution of both sodium bi-sulphite and potassium cyanide was made. A measured quantity of 10 c.c. of the potassium cyanide solution was then measured off in a burette, and allowed to flow into a beaker. From another burette, the sodium bi-sulphite solution was allowed to flow until the resulting solution became neutral, thus indicating that one solution had neutralized the other. This point was ascertained by means of test paper. When neither blue or red litmus paper was changed, it was assumed that the solution was neutral.

It was found that to neutralize the 10 c.c. of the potassium cyanide solution used, 50 c.c. of the sodium bi-sulphite solution was required. In other words, *5 oz. of sodium bi-sulphite will neutralize 1 oz of potassium cyanide;* and while in ordinary cases this will not be sufficient seriously to affect a plating solution, yet it is frequently necessary to take the fact into consideration in making an addition of sodium bi-sulphite, particularly if frequent additions are made, as they often are in regular work.

"Stellite" an Alloy of Cobalt and Chromium and its use for Cutlery.

In The Brass World, Sept. 1910, page 321, a description of the new alloy of cobalt and chromium discovered by Elwood Haynes of Kokomo, Ind., was given. This remarkable alloy, which rivals gold and platinum in its non-corrosive properties and at the same time is capable of taking a fine cutting edge, is now being made into pocket knives. Mr Haynes has recently applied the name of "Stellite" to this alloy. As mentioned in the aforesaid article, the alloy consists of practically 75% cobalt and 25% chromium. The alloy has proved so satisfactory for cutlery, that Mr. Haynes has compiled the following directions for the sharpening and care of cutlery made of it. They are sent with the cutlery and are so novel as to be interesting:

"The blades of this knife are not made of steel, but of an alloy called 'Stellite', which is a mixture of semi-rare metals. Only one of these metals is in use at all, and only to a limited extent, as a constituent of armor plate and burglar proof safes. It is safe to say that not one person in a hundred thousand has ever seen either of the metals composing this blade. When you become the owner of this knife, therefore, you possess an article that is at once unique and useful. This knife is *not* guaranteed against mechanical injury resulting from abuse or misuse. The blades are as hard as mild steel, and much tougher.

The blades of this knife are guaranteed not to rust or tarnish under atmospheric influences of any sort whatever. They will remain perfectly bright after being used for cutting all kinds of fruit, such as applies, oranges, lemons, etc.

To sharpen this knife, use preferably a small carborundum stone. Do not lay the blade flat upon the stone, but hold it in such a manner that it forms an angle of about 30 degrees with the surface fo the stone. A very slight amount of whetting will bring the knife to a keen edge. Be very careful not to whet the knife too much, or a "wire-edge" will be formed. After bringing the knife to a fairly good cutting edge on the carborundum stone, make a thick lather of soap and water and mix with it a very small quantity of carborundum flour or emery flour. Spread this mixture on a strip of soft wood, having an even surface. Then draw the blade gently back and forth over this board, turning it each time as in sharpening a razor.

It is very seldom that the knife will need to be sharpened on a whetstone. Once or twice a year will probably be sufficient. If desired, the blade may be stropped on an ordinary razor strop after stropping on the wooden strip. Do not turn your knife over to a knife grinder to be ground. He may injure or ruin it.

The name 'Stellite' must appear on one side of the blade. The composition of these blades is protected by patents."

The largest lamp manufactory in Russia is located in the Vistula Provinces near Warsaw. The annual output is valued at about $515,000. There are seven other companies manufacturing lamps in that country and six of them are located in Lodz. About 1,100 workmen are employed.

Depositing Nickel and Other Metals by Friction (Rosenberg's Method).

A short time ago the electroplating world was more or less agitated by the announcement that Augustus Rosenberg of London, England had discovered a process of depositing metals by means of a powder and simply rubbing it on a metallic surface with a wet rag. While the fact has long been known that silver can be deposited in such a manner, nickel and other common metals had not been so deposited. The powder used for this purpose was named "Galvanit." The usual meagre preliminary reports of the process gave most of the features of the method used, but now patents have been granted to the inventor (U. S. Patents 970,755 and 970,852, Sept. 20th, 1910). The patents give the full details of the process. The description by the inventor is as follows:

"This invention relates to the art of plating electrically conductive surfaces with metals and to that particular method in which the article is coated by the frictional application of a powder to its surface. My invention differs however from such method inasmuch as it is based on the employment of a mixture of ingredients containing all that is necessary, when the mixture is brought into contact with water, to set up electrolytic action so that actual electrodeposition of the metal is brought about by electrolytic action notwithstanding that no external source of current is employed. The process may be conveniently carried into effect by dipping a wet rag into the mixture so as to cause it to take up a sufficient quantity of the mixture and then rubbing the mixture adhering to the rag onto the surface of the article to be coated and repeating the operation as often as necessary to obtain the desired result.

As an example of a mixture prepared in accordance with my invention, I will give the formula of a mixture suitable for use in plating metals with nickel: This formula is as follows:

Nickel ammonium sulphate	60 parts
Magnesium	3 parts
Chalk	30 parts
Talc powder	7 parts
	100 parts

In this example, the electropositive metal above referred to is the magnesium which is particularly adapted for the purpose as it is electropositive with respect to all of the common metals generally used for plating.

The ammonium sulphate radical in the above formula constitutes, when moistened with water, the electrolyte. In this connection it may be noted that the use of an ammoniacal salt as an electrolyte is particularly recommended when the surface to be plated is greasy, as the alkaline solution of the ammonia gas liberated in the reaction dissolves the grease and thus facilitates the plating operation.

The talc powder in the above formula has the function of preventing the ammonium sulphate from acting upon the other ingredients in consequence of the absorption of moisture from the atmosphere, and the use of this or an equivalent substance is an important feature of the invention, since it permits the mixture to be stored or to be exposed to the atmosphere for lengthy periods without substantial deterioration.

The chalk of the formula acts as a diluent or filling and retards the action of the elements of the compound on each other, thereby affording the necessary time for the electrolytic action to occur in the best manner. The chalk is also useful, as it insures an alkaline reaction in the electrolyte. The chalk has a further mechanical function which wiill be referred to later. In the above-described operation the chalk, in addition to the functions specifically described, acts as a mechanical polishing agent, so that the frictional application of the mixture results: first, in the cleansing and polishing of the conductive surface; second, in the deposition of the nickel; and third, in polishing the newly deposited nickel.

While the talc powder acts as above pointed out to prevent the absorption of moisture from the atmosphere and thus to prevent premature chemical action between the ingredients of the mixture, I find it useful, particularly where a strongly electropositive metal, such as magnesium, is employed to prevent oxidation and protect such metal absolutely from contact with the corrosive electrolytic salt, and to this end I have devised the expedient of coating the particles of the electropositive metal with an inert substance preferably of waterproof character, for which

purpose I find organic substances, such as waxes and resins, to be suitable. The most convenient way in which to coat the particles is to moisten them with a solution of wax or resin in gasoline or other volatile solvent, and then dry out the solvent, after which the coated metal is mixed with the other ingredients of the mixture. When the mixture is used the friction employed in the application quickly causes the removal of the coating material and the exposure of the metal to the electrolyte. The coating of the electropositive metal has the further advantage that it prevents chemical action upon the electropositive metal upon the first wetting of the mixture, and this affords opportunity for the salt of the metal in solution to be deposited.

As an example of a mixture prepared in accordance with my invention I will give the formula of a mixture suitable for use in plating metals such as iron or copper with zinc. This formula is as follows:

Zinc dust (commercial)	45 parts
Ammonium sulphate	15 parts
Magnesium	3 parts
Chalk	30 parts
Talc powder	7 parts
	100

My invention is applicable for depositing almost any metal upon itself, for example, zinc upon zinc, or upon any other metal generally used in the art of electroplating, and it will be understood that the several ingredients herein above referred to may be used in proportions widely varying from those given in the preceding formulae, and that the use of some of them is optional and is governed by the widely varying purposes for which my invention may be used.

In the application of the mixture in the manner described, the electropositive metal constitutes the anode and the object to be coated the cathode and both being in suspension in the electrolyte, current is generated. Owing to the comminuted state of the electropositive metal, innumerable small contacts with the cathode surface are made and the particles of electropositive metal act as so many minute anodes, each setting up local circulations of electric current. The circuits are so excessively small, so exceedingly near together and so numerous that they cannot be separately observed, but each causes a deposit of the metal to be deposited upon the cathode surface. Owing to the number of small currents generated these, as they leave the liquid, deposit a film of the metal to be deposited over the surface to be coated.

A Hydraulic Pressure Casting Machine.

This seems to be the age of pressure casting machines. Among the latest is one recently patented by Frederick T. Kitchen of New York City and assigned to the Compressed Metal Co., (U. S. Patent 969,539, Sept. 6, 1910.) The feature of the machine lies in the

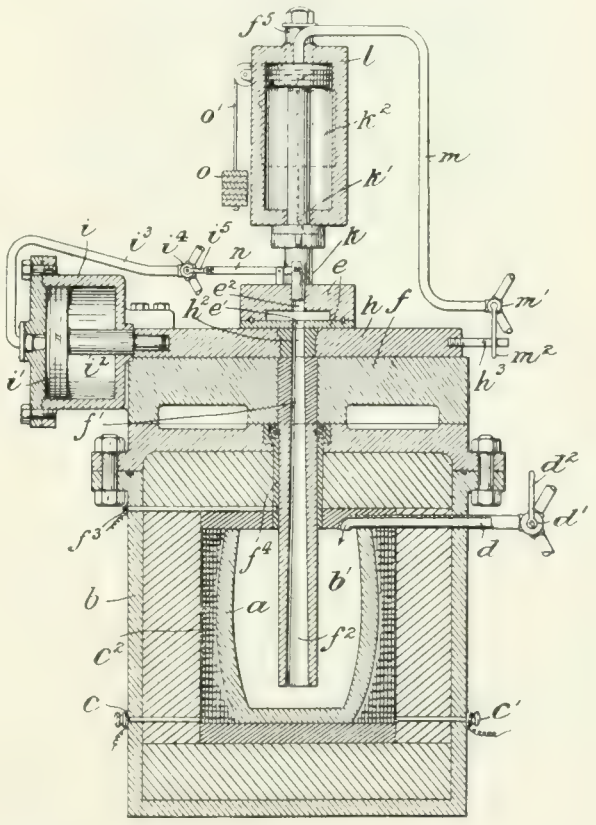


Fig. 1. Cross-Section of the Hydraulic Pressure Casting Machine.

fact that the metal is forced into the mold under ordinary pressure, and then subjected to hydraulic pressure in order to render the structure as dense as possible. The metal is melted in a crucible, and the process is adapted to high melting metals, such as brass, as well as the low melting ones.

The metal is melted in the crucible shown in Fig. 1 and which is heated by an electrical resistance furnace. The mold is indicated by *e* and the metal, when melted, is forced into it by means of the pressure applied through the pipe *d*. This forces the metal into the mold. When this has been done, the mouth

of the mold-gate is closed by moving the base *h* by means of the piston arrangement *i*. Hydraulic or other strong pressure is then applied to the metal by the ram *l* on the top of

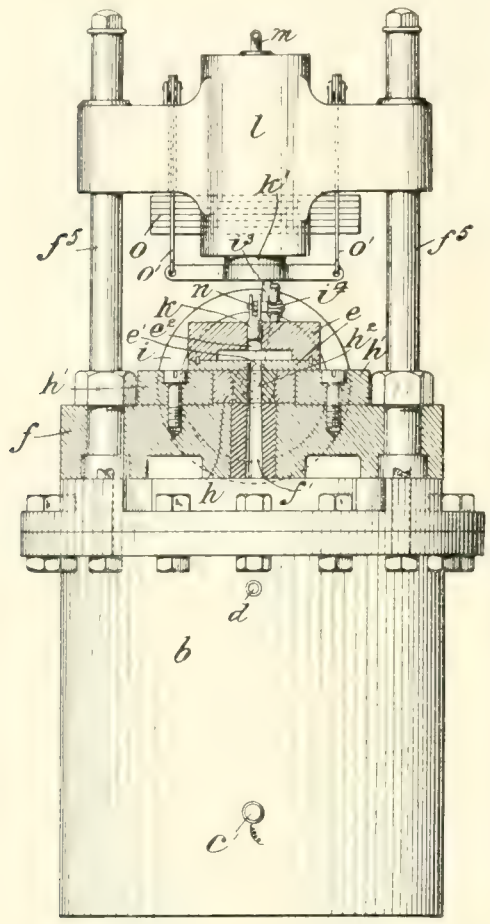


Fig. 2. Front View of the Pressure Casting Machine.

the mold. In this manner the density of the casting is increased and soundness and strength are obtained.

Correspondence.

Chinese-Tin.

Editor:

In view of the "corner" on the Straits tin market, we wish to call your attention to the following analysis of "Chinese tin" which we are now importing:

Tin	99.531%
Lead	.256%
Arsenic	.079%
Iron	.006%
Copper	.094%
Silver	.002%
Sulphur	.008%
Antimony	.024%
Bismuth	none
Zinc	none
Cadmium	none
Nickel and Cobalt	none
Manganese	none
Tungsten	none
Phosphorus	trace

This tin comes in pigs of the same shape and approximately the same weight as Straits tin, and at present is being used by fastidious concerns in place of the Straits or Malacca tin.

Vernon Metal Co., Inc.

New York City, Sept. 16th, 1910.

Improved Process of Refining Brass Scrap.

A number of years ago, G. H. Clamer of the Ajax Metal Co., of Philadelphia, Pa., discovered a process for refining brass scrap and a patent was granted upon it. He found that by melting ordinary scrap brass which usually contains copper, tin, lead, zinc, manganese, iron, aluminum and other impurities, and treating with oxide of lead, the iron, zinc, aluminum and manganese in the mixture react with the oxide and reduce it to metal. The reduced lead enters the mixture while the oxides of zinc, manganese, aluminum and iron go into the slag.

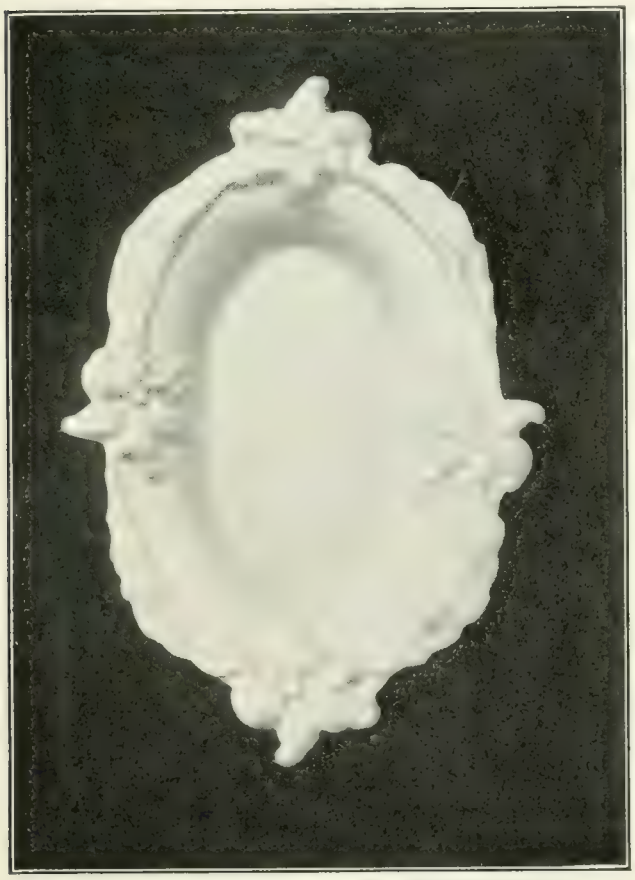
An improvement has now been made upon the process and a patent granted upon the improvement (U. S. Patent 970,686, Sept. 20, 1910). In this process the brass scrap is melted with a flux, such as silica and lime, or silica and soda-ash, and then air is blown through it. The zinc, iron, aluminum and manganese, being more easily oxidized than the copper, tin and lead, enter the slag. When most of the zinc is removed, which may be ascertained by the gradual disappearance of the familiar zinc colored flame, oxide of lead is added and the remainder of the zinc eliminated. The iron, aluminum and manganese are all oxidized before the zinc on account of the fact that they have a greater affinity for oxygen.

In this improved method, it is possible to obtain a resulting mixture of metals, containing copper, tin and lead, with less lead in it than is possible when the brass scrap is first treated with oxide of lead and an amount of lead corresponding to the quantity of zinc present in the scrap is reduced and enters the mixture.

Satin-Finishing Aluminum by Means of a Dip.

Aluminum has one peculiarity not possessed by other metals which ,occur in commerce and that is its property of being acted upon by caustic alkalies. Among the common metals zinc is slightly acted upon by alkaline solutions, but not to the extent that aluminum is, nor is any use made of the action.

When aluminum is immersed in a solution of caustic potash or caustic soda, a chemical action is set up. Hydrogen gas is given off from the surface and the aluminum is slowly dissolved with the formation of an aluminate of the potash or soda. As the aluminum is dissolved, the surface is left in a matt or dead condition and use is made of this fact in the production of the satin finish.



Aluminum Article Satin-Finished by Dipping, Illustrating the Application.

To satin finish the aluminum by means of the dip is a simple matter and something that can be done by all platers. It requires no particular skill. Make up the following solution:

Water	1 gallon
Caustic Potash or Soda	1 lb.

Use this dip hot and immerse the aluminum, previously cleaned, in it. Gas will immediately be given off from the surface. As soon as it is given off freely and uniformly, remove the aluminum and rinse in cold water. It will be found that the surface, although dead or matt, is covered with a black film. This is iron. While silicon is present in the aluminum and is generally believed to leave a black film on the surface also, it is either dissolved by the alkali or goes off as silicon hydride so that it is not harmful. To remove the iron film on the surface of the aluminum left by the potash or soda, make up the following dip:

Water	1 gallon
Nitric acid	1 gallon

Use this dip cold and immerse the aluminum in it after it comes from the potash or soda solution and has been rinsed in cold water. The film of iron is at once removed and a clean and uniformly white surface is obtained and one that is frosted. In case the surface is not even or satisfactory, the various operations may be repeated.

The aluminum should not be allowed to remain in the potash or soda solution any longer than is necessary as the surface will be too strongly attacked and left rough.

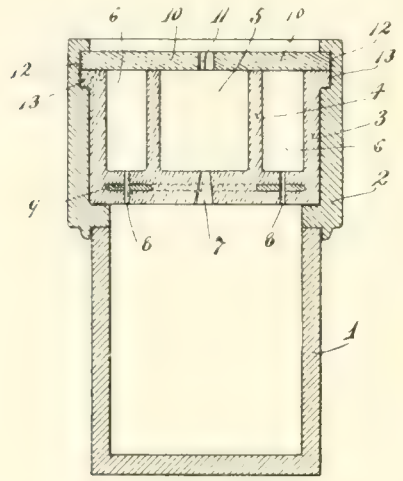
The foregoing method gives a beautiful frosted surface to the aluminum, but in case there are imperfections in the surface such as streaks or pits, it will uncover them to a marked degree. For this reason the use of the satin finish brush is to be preferred for large work. For small work, both on cast and sheet metal, the dip can be used to a good advantage as it is so simple to use and the results are quite certain if the metal surface itself is good.

Improved "Washburn" Riser Linings.

In THE BRASS WORLD, Sept. 1910, page 317, the "Washburn" clay riser lining was described. It consists of a clay article, shaped like a flower-pot, that is rammed up with the casting, making the riser. The fact that the clay is dry prevents rapid cooling, and the shape of the lining is such that the riser breaks off, thus obviating cutting with a hack saw. The inventor E. C. Washburn, has now improved these linings so that they can be adapted to the casting of ingots or billets in iron as well as in sand molds.

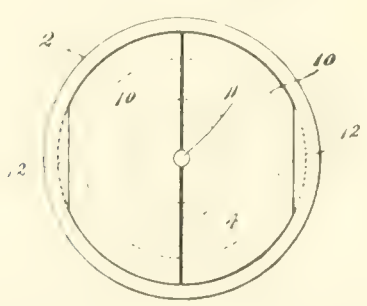
Referring first to the construction shown in Figs. 1 and 2, the numeral 1 indicates a metallic mold provided with a supplemental detachable rim section 2. The riser-lining 3, is shown in said views (Figs. 1 and 2), is cup-shaped, rests in a suitable seat formed in the mold section 2 and is, as shown, provided with an inner cylindrical web or partition 4 that divides the cavity of the riser-lining in

Fig. 1



a central chamber 5 and a surrounding outer chamber 6. A downwardly flaring metal passage 7 opens through the bottom of the riser-lining 3 from the central chamber 5. The purpose of this downward flare or upward taper of the metal passage 7 will be hereinafter noted. Relatively small metal passages 8 open through the bottom of the riser-lining 3 from the outer chamber 6 and, as shown, these passages 8 lead also through a metallic

Fig. 2



reinforcing ring 9, which is embedded in the bottom of the said riser-lining. In this arrangement of the riser-lining, the central chamber 5 and the passage 7 are adapted to serve as a gate through which metal may be poured into the mold 1 as well as a riser permitting the metal to flow backward from the mold into the said chamber 5, and the outer chamber 6 serves as an auxiliary riser. Both chambers of the riser-lining are adapted to be closed by a two-part disk-like cover 10, having a hole 11 that opens from the central chamber 5. At diametrically opposite points, the edges of the cover 10 are adapted to be inserted into segmental notches 12 formed in the upper side portions of the supplemental mold section 2, and the riser lining 3 itself is provided with diametrically opposite outturned flanges 13, that are also normally seated in the notches 12 so that the riser-lining is interlocked to said mold section 2 and, hence, held against accidental uplifting.

The molten metal, from which the casting is to be formed, is poured into the mold through the cover hole 11, central chamber 5

Fig. 3

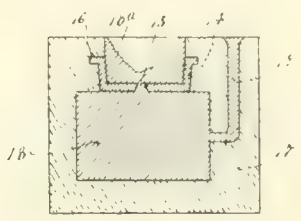


Fig. 6

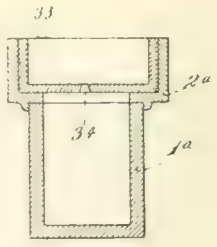


Fig. 4

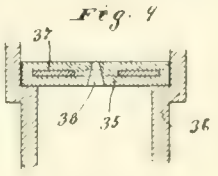


Fig. 6

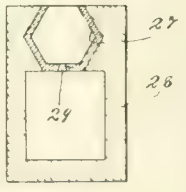


Fig. 4

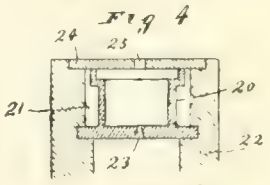


Fig. 7

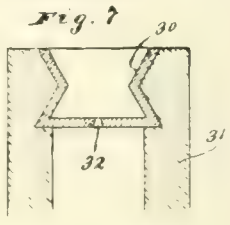
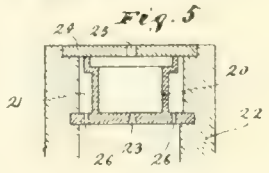


Fig. 5



and passage 7, and sufficient metal is poured to completely fill the mold and to partly fill the chambers 5 and 6. When the metal cools and contracts, a supply of the molten metal may flow back from the chambers 5 and 6 and compensate for shrinkage and thus prevent flaws in the casting. The cover 10, which is also preferably of baked clay or similar non-fusible heat-insulating material, prevents rapid radiation and cooling of the metal in the chambers 5 and 6.

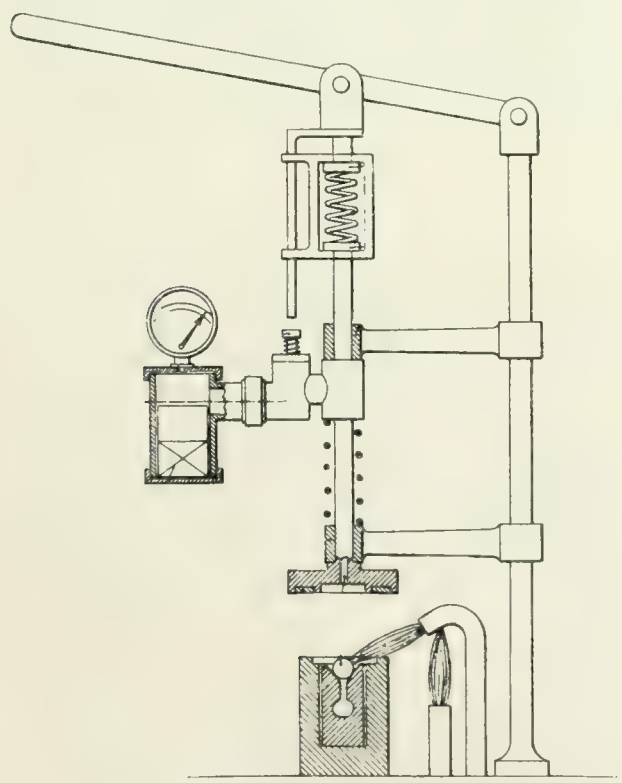
After the casting is cooled, the riser-lining may be broken and then the metallic neck portions, cast in the passages 7 and 8 and which connect the main body of the casting with the residue left in the chambers 5 and 6, may be

easily broken off. The relatively small neck portions, formed in the passages 8, will be very easily broken and there will be little or no liability of making depressions in the main body of the casting. The relatively large neck positions 7, however, if broken directly from the main body of the casting, would be very likely to make a depression or imperfection in the surface thereof and, for this reason, it is made smaller at its upper end so that it will break primarily from the cast residue in the central chamber 5 and may be readily ground down to the surface of the casting.

In the lining shown in Fig. 3, the lining 14 is cup-shaped and has a downwardly flaring central passage 15 for the metal and an anchoring flange 16 at its upper edge so that when imbedded in a sand mold 17, it will be anchored. Figs. 4 to 9 are special forms of risers to meet certain requirements found in casting metals.

Apparatus for Making Small Castings Under Pressure.

A novel apparatus for making small castings under pressure has been patented by Benvenuto Platschick of Paris, France, (U. S. Patent 970,949, Sept. 20, 1910). While the



The Pressure Casting Machine.

apparatus has been designed more particularly for making dental castings, it can be used for other work.

The metal is melted on the top of the mold by means of a blowpipe, and a plunger carrying a cap is then forced down upon it. The mold is then covered automatically by the cap, while at the same time pressure is exerted by the release of a valve supplying air pressure. All that the operator is required to do is to melt the metal and then force the plunger down.

A Remarkable Non-Corrosive Steel.

That the non-ferrous metals are beginning to have a competitor in the special non-corrosive steels (apparently containing a large percentage of nickel to render them non-corrosive) is evidenced by the following description of a new gun-barrel steel as given by *The Ironmonger:*

The Poldi Steelworks, of Sheffield, have brought out a new brand of steel for gun barrels which is practically rustless, and consequently meets a want created by the use of smokeless powder. Hitherto much inconvenience has been experienced owing to the necessity of cleaning a gun barrel after every "shoot" with smokless powder, in order to avoid rusting, but the Poldi Steelworks claim that the new steel resists the effects of resi dues occasioned by the combustion of smokeless powder to such a degree that barrels may be left uncleaned for several days after a "shoot" without damage. In tensile strength and toughness this metal admits of the heaviest strains and, in consequence, of the heaviest charges, its test figures being as follows:

Ultimate tensile strength, about 63½ tons per square in.

Elastic limit, about 54 tons per square in.

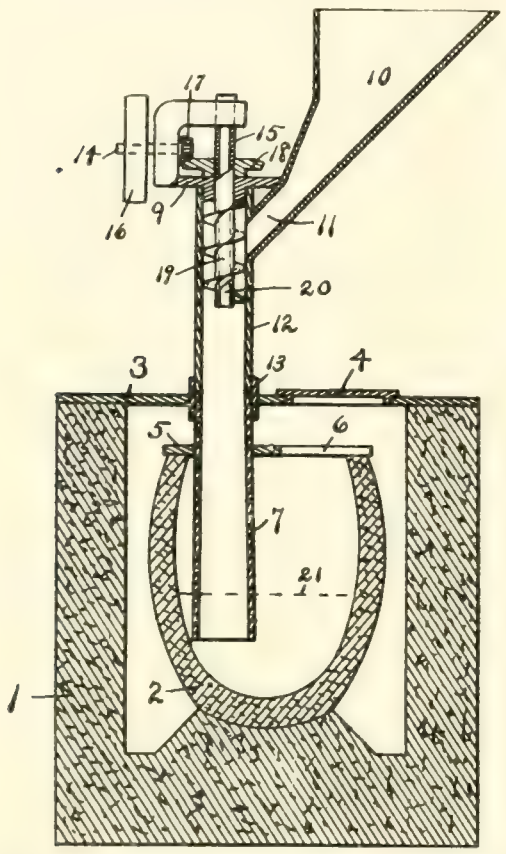
Elongation in 4 in., about 15 per cent.

Reduction of area, about 55 per cent.

Two barrels made of this steel, which are being exhibited at the International Hunting and Shooting Exhibition at Vienna, were fired five times with smokeless powder at intervals of ten days, and kept in a damp cellar and never cleaned,throughout 150 days of the duration of the test. At its conclusion, and immediately before they were cut in two, they were cleaned in the ordinary way with soap and then greased. In spite of such severe conditions of testing the barrels show no sign of rust whatever.

A New Device for Use in Melting Brass Chips in a Crucible.

A new device for melting brass chips in crucibles has recently been patented by A. W. Diack of Detroit, Mich. (U. S. Patent 969,253, Sept. 6th, 1910). The device is herewith illustrated. The apparatus is placed on the furnace and the tube 7 is inserted in the crucible. The chips are fed into the hopper 10. The apparatus may be used either for the melting of chips or skimmings. The inventor describes the method of using it as follows:



Device for Feeding Chips etc. into the Crucible During Melting.

When the apparatus used in the drawing is employed, the mixed oxide and metal are thrown into the hopper 10, and slip down to the pipe 12 through the spout 11. The screw 19 slowly feeds down this material at a constant speed, forcing it down into the molten mass which fills the lower end of the tube 7. By the time the material is forced out of the lower end of the tube, the metal will have been melted and absorbed by the molten mass in the crucible and the oxide will float to the surface 21 of the mass. As more metal is added to the amount already in the crucible, and the surface rises, the oxide will come near to the opening 6 where it can be skimmed off.

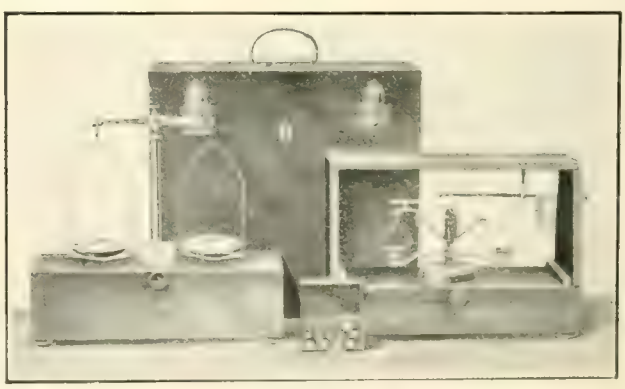
In order to insure easy movement the tube 7 may be formed slightly tapering, the smaller end being upward. A metal rod can be thrust down through the bore 20 of the tube 15, should the material bridge or cake in the tube 7.

This process may be modified to recover the metal of borings and scraps of such metals as readily oxidize near the melting point. A quantity of the metal is first melted, after which the borings and scraps are forced down into the molten mass trough the tube 7. This tube prevents the oxidizing flame from reaching the finely divided metal, which really does not melt until under the surface of the main mass. The tube 7 or its equivalent can be filled with an un-oxidizing or neutral atmosphere so as to further protect the metal.

It is sometimes desirable to mix a proper flux such as ammonium chloride with the mixed metal and oxides and with the metal borings before submerging the same in the molten metal.

New Chemical Balances.

Some new and useful types of balances for use by chemists, platers and gold and silversmiths have recently been placed on the market by Voland & Sons, of New Rochelle, N. Y., the well known manufacturers of fine balances. The new types, herewith illustrated, are made in portable form so that they may readily be transported. The balances are supplied with cases for carrying and the kinds shown are the variety known as a "pulp balance" for rough weighing, and a "button balance" for weighing gold and silver beads obtained in assaying.



These balances are made to satisfy the demand for types of this kind, and such modifications will be found useful in a number of lines of trade.

Crystallization of Block-Tin Pipe.

Pure tin is not a very satisfactory material for structural purposes as it has the property of crystallizing under certain conditions. One of the extensive uses of block-tin pipe is in distilling water. The pipe is used for the cooling worm. Water has practically no action on pure tin, and, therefore, it is possible to obtain pure water by its use. There is no other common metal that is inert to pure water.

Block-Tin Pipe that Crystallized While in Use.

It is well known that pure tin will crystallize at very low temperatures, but the accompanying illustration shows the fracture of a piece of block tin pipe that was used for a distilled water worm. The steam used was taken from a steam boiler used for running a small steam engine. For about 18 inches or so the tin worm became brittle after several years usage and could readily be broken. When the fracture was examined, it was found that it had a very marked crystalline fracture as shown. The alternate heating and cooling were probably the cause of the crystallization, as the temperature did not rise above that of boiling water, on account of the fact that the steam was not under pressure.

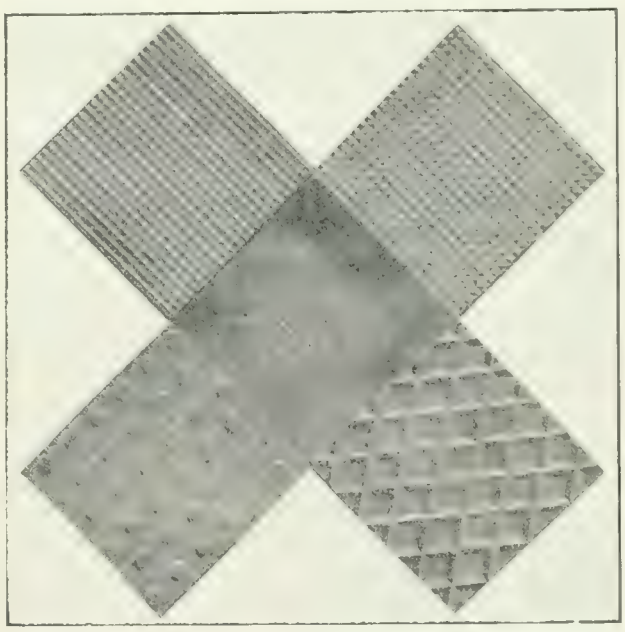
Blisters in sterling-silver sheet are caused by the presence of blowholes in the cast bars before rolling and which are produced by overheating the silver during melting.

Use of Aluminum Matting Instead of Rubber.

One of the recent uses of aluminum is for matting upon the steps of automobiles and similar places. It is now being used with good results and a variety of different patterns, such as those herewith illustrated, can now be obtained. While such matting can be purchased in the United States, the samples herewith shown are manufactured by an English company, the British Insulated & Helsby Cables Co., one of the largest makers of copper wire in the world.

The matting is made of fairly thin sheet aluminum and its surface is raised by punching or embossing both to strengthen or stiffen the sheet and at the same time provide as rough a surface as possible for the feet.

The advantage of aluminum for this purpose lies in the fact that it is soft. It is well known that lead forms an excellent surface



for covering stair treads, and is now largely used in the form of imbedded strips. The softness of the metal, together with the grit that imbeds itself in the lead, prevents the slipping of the feet, even though the surface may be wet. Aluminum seems to act in the same manner, although not quite as satisfactorily as lead; but its lightness is such that it can be used in instances where lead would be out of the question, as, for example, on automobiles. The use of aluminum for this purpose is now such that it has replaced rubber in a number of instances and will probably replace it in the future even to a greater extent.

Questions and Answers.

QUESTION No. 865. Are electric welded steel tanks as good as wood for holding cyanide copper and brass solutions? We have heard that wood is preferable, while some platers maintain that steel tanks are the best.

Answer. The only advantage of steel tanks is that they are practically indestructible. Their only disadvantage is the care that is required in avoiding short-circuiting of the current. This is not a difficult matter, however, and when done, steel tanks are very satisfactory. They do not leak or split and there is no danger of losing the solution in them by leakage. Steel tanks for holding cyanide solutions have been found so satisfactory that they are now extensively used, even for holding silver plating solutions. In a large silver plating tank, the leakage of the solution is a serious matter as it means a loss of considerable money, so that by the use of steel tanks, it is avoided. You had better coat the tanks with asphalt like the interior of a wood tank as it will serve to insulate and protect them.

QUESTION No. 866. What metals can be used to withstand a red-heat for some time without scaling? A metal or alloy will answer and it must not soften at a good red heat so as to alter its shape.

Answer. You will find the nickel alloys the most satisfactory among the common metals. Pure nickel is excellent or any other alloy containing a large percentage of nickel? Among the latter alloys is "Monel-Metal", a mixture of 3 parts of nickel and 1 part of copper with a little iron. This alloy is cheap and will not scale at a red heat. The best metal, however, is platinum and its alloys, but they may be too expensive for your purpose.

QUESTION No. 871. Is the grip part of the steel handles of pliers, pincers, etc., checkered by etching or by a die? On many goods it is so finely done that we thought that it might be done by etching.

Answer. The checker work is invariably done with a die. Etching would be very expensive on this work and could not give as good a surface as the die.

QUESTION No. 872. Is there any spelter solder on the market that can be used to braze brass tubing? We have not been able to do it with ordinary spelter solder as it makes the brass crack.

Answer. You will find considerable difficulty, if not an impossibility, in brazing ordinary brass tubing with spelter solder. Brass tubing usually contains from 61 to 65 per cent of copper, while brazing solder contains about 50 per cent. The melting points of the tubing and the solder are too nearly alike. It is customary to make tubing to be brazed of a richer mixture. One for this purpose usually contains from 70 to 75 per cent of copper so that it will not melt or become brittle in brazing at the temperature at which the brazing solution melts. You may be able to braze your tubing with silver solder as this melts at a lower temperature than ordinary half and half spelter solder.

QUESTION No. 873. When I put work in my cyanide copper solution, the ammeter shows 150 amperes and the voltmeter 2 volts. After the work has been in the solution for 15 minutes, the amperes drop to 75 or 100 while the voltage goes up to 3½. Can you tell the reason for this?

Answer. The reason for your apparent paradox is that when your work enters the tank, the copper anodes are clean and you are able to pass the full current through the solution. As the deposition goes on, the anodes coat over and thus impede the passage of the current so that the amperage drops while the voltage goes up. You have too little free cyanide in your solution. Add some more and it will keep your anodes clean.

QUESTION No. 874. What are the cause of blisters in rolled sterling-silver?

Answers. Blisters in sterling-silver are caused, as a usual rule, by overheating the silver during melting and with the accompanying formation of blowholes which, when the metal is rolled, become blisters. Blisters may also be formed by overheating the silver during annealing.

QUESTION No. 875. How is gum-guaiacum varnish made for the etching of steel by the rubber stamp method?

Answer. The varnish is made by dissolving the gum-guaiacum in wood alcohol and then filtering to remove foreign matter. It is used rather thin. It is usually customary to color it either pink or blue by means of alcohol-soluble analine dyes in order to render it visible when spread on a metallic surface.

QUESTION No. 876. What is the sheet metal that is used by metal workers for covering the doors, window-frames, etc., on fire-proof buildings? It is neither brass nor copper.

Answer. The material used is frequently the so-called sheet bronze. It consists of 90% copper and 10% zinc and has a bronze color. It is practically as soft as copper and in addition stands the action of the atmosphere better. In the brass rolling mill trade it is known as "sheet-bronze".

QUESTION No. 877. We have a customer who desires a green finish on the steel furniture we are making for him. We ask you, therefore, to give us a formula for the method of producing the verde-antique on such goods.

Answer. There are two methods in use for work of your kind: First, the corrosion process that has been described from time to time in THE BRASS WORLD, and the pigment process (also described). The corrosion process is very difficult to use on steel goods, as it is almost impossible to give it a copper deposit sufficiently thick on all parts to prevent the solution used for corrosion from penetrating to

the steel base and making red blotches. The pigment process will have to be employed on your furniture. This is made by mixing a lacquer with a suitable pigment, such as chrome-green. Do not use too light a shade of pigment as light verdes are not as much admired as those which are dark. Chrome-green is a dark pigment and may be still further darkened by the use of lampblack. The various lacquer manufacturers sell solutions for making the verde finish by the pigment process.

QUESTION No. 878. What is the alloy known as "Pyrophor" made in Germany and used for producing a light when struck?

Answer. This is an alloy of 85% cerium and 15% magnesium. When struck with hard steel it has the property of emitting sparks.

QUESTION No. 879. We send you a bronze spectacle frame that was first dipped, then well rinsed and lacquered. You will note that the lacquer is spotted. What causes the spotting?

Answer. The frame seems to have spotted on account of the peeling of the lacquer as an examination with a magnifying glass shows. Either the lacquer was unsuitable for the work, or the surface of the frame was more or less greasy when the lacquer was applied. The grease was probably the cause of the trouble, as platers or manufacturers do not seem to realize that the surface of a metal to be lacquered should be as clean as for plating or the lacquer will not hold. Lacquer will not adhere to a greasy surface.

QUESTION No. 880. How can copper be hardened by the use of chromium?

Answer. You can melt the two together if you desire to make an alloy of copper and chromium. Metallic chromium may now be purchased quite cheap, but you may find some trouble in melting it on account of its high melting point. It will take the best form of gas furnace with a blast to melt the two together, and an electric furnace is really better.

QUESTION No. 881. I have some flat steel springs that I wish to copper plate. These springs are very thin and I have been informed that they cannot be plated without breaking. If this is the case, how can I do the work?

Answer. We presume your springs are made of regular high carbon spring steel. If this is the case, the cyanide copper solution will either weaken or break then during the plating on account of the absorption of hydrogen. You will have to dip copper them in the following solution:

Water	1 gallon
Copper Sulphate	1 oz.
Sulphuric Acid	1 oz.

Use this solution cold without any current and as soon as the steel is coppered, remove it rinse well in water and dry in sawdust. Then lacquer them if possible. The steel must be free from oil or grease before immersion in the dip or it will act very unevenly.

QUESTION No. 882. What do you consider the best and cheapest matrial for use in sand-blasting parts of a telephone, such as the base, previous to japanning? Have tried sea-sand, flint, and emery. Emery does not seem to do particularly good work. Flint No. 3 grade is good while it lasts. Sea-sand is all right and seems better than flint, but it varies. One lot is all right and the next is too fine. What do you recommend?

Answer. Sea-sand is generally used in a sand-blast, and if you are not able to obtain it uniform, you should insist upon specifications being lived up to. In the east there is no difficulty in obtaining satisfactory sea-sand. With sea-sand of good quality and a good blast, you should have no trouble in producing the surface that you desire.

QUESTION No. 883. What is the best method of obtaining a black finish on sheet steel articles?

Answer. You will find a black nickel deposit very satisfactory for this purpose as it is quite black and durable. It is now extensively used for such work.

QUESTION No. 884. I have some nickel in pigs weighing about 50 lbs. each and find it difficult to use them in a crucible. Is there any method by which I can make shot nickel of them?

Answer. The only way to make shot nickel of your pigs is to melt them and then pour into water. This is the method invariably followed for making shot metals.

QUESTION No. 885. We have a bronze solution that is bothering us. We are plating cast iron, and while the solution seems to plate all right on small pieces, on large pieces it plates several different colors. On some parts of an article brass will be deposited, while on others, bronze is plated. Our solution stand about 10 degrees Beaumé and we have added ammonia to it. The pieces we are plating are about 12 feet long. What is the cause of the different colored deposits?

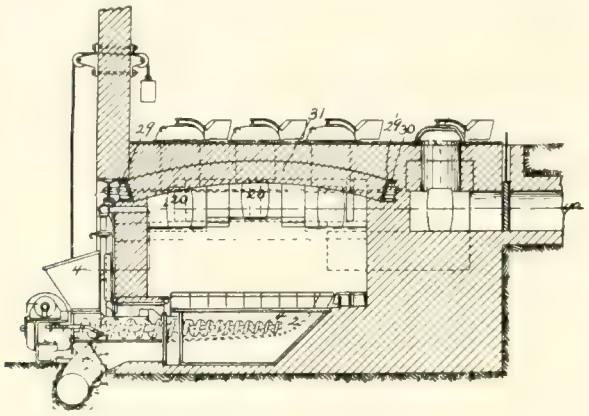
Answer. We should say your solution is somewhat weak for plating cast iron. We advocate strengthening it up to about 15 or 20 degrees Beaumé. You will also find that giving the cast-iron a preliminary copper deposit in a hot cyanide copper solution will greatly assist you in obtaining a good bronze deposit. The fact that you are obtaining several colors on your deposit would seem to indicate that you have too little free cyanide in the solution, although when ammonia is used, it is difficult to say whether the free cyanide or the ammonia is the cause. We advocate leaving out the ammonia in a bronze solution as it has no value in it, and is seldom used by bronze platers.

QUESTION No. 890. Will cast-iron spot out any more when plated with one deposit than another?

Answer. Yes! There is a vast difference in the spotting-out when plated in different solutions. The cyanide solutions give the most trouble, as the solution seems to penetrate deeper than others. Nickel solutions do not give very much trouble. If the article that have been nickel plated, are well rinsed, they will not spot out to any extent.

Patent Abstracts.

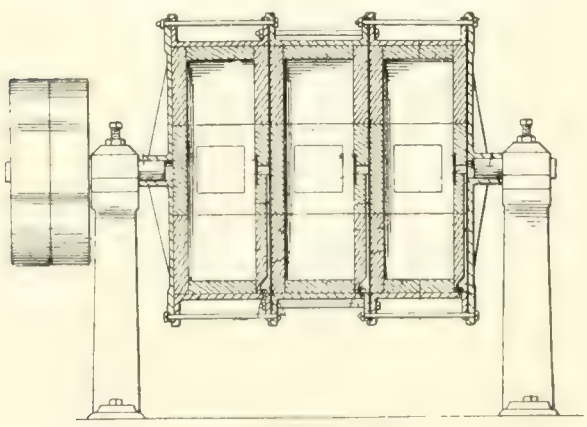
969,066, Aug. 30, 1910. MELTING FURNACE.? John A. Leiter and Chas. P. Oakman of Erie, Pa. Assignors to the American Stoker Co., of Erie, Pa. A furnace for



use with soft coal or other cheap forms of coal. It has been designed particularly for melting brass. A low melting cost is claimed for the furnace.

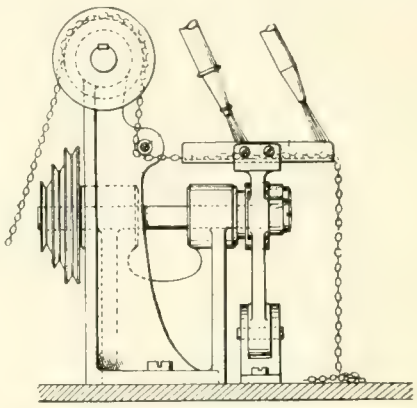
969,610, Sept. 6, 1910. METHOD OF ATTACHING STEEL TO STEEL OR STEEL TO IRON. Geo. Dawson, Crescent, La. The process is applied to the brazing of saws. They are brazed as usual with brazing solder, and then a mixture of slaked lime and lampblack is applied to the joint which draws the temper back in the steel.

970,977, Sept. 20, 1910. TUMBLING BARREL. George E. Abbott of Hartford, Conn. Assignor to the Globe Machine & Stamping Co., of Cleveland, Ohio. A tumbling barrel designed particularly for tumbling small metal goods with steel balls for burnishing them.



It is made in one or more sections as may be desired. Each section may also be independently vented. The barrels are made of wood and fastened in a substantial manner. The manner in which the barrel or barrels are constructed constitutes the feature of the patent.

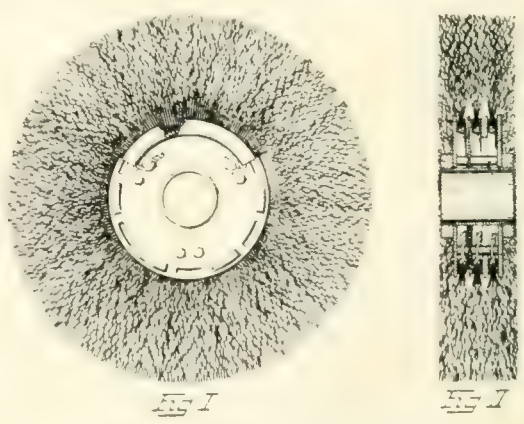
970,726, Sept. 20, 1910. METHOD OF SOLDERING CHAIN LINKS. Rudolf Kunzmann and Erwin Stierle of Pforzheim, Germany. Assignors to the firm of Andreas Daub of the same place. The apparatus is designed for use in soldering chain links to be used for jewelry. It can only be applied



to the soldering of wire which is made of a core of inferior metal such as solder and covered with a precious or superior metal. The machine is designed to feed the links automatically before a blow-pipe which melts the solder in the core and thus joins the links.

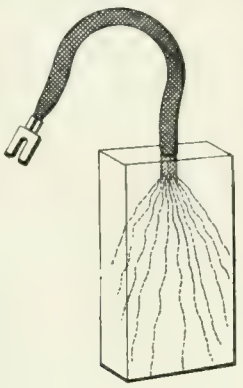
970,992, Sept. 20, 1910. TOOL FOR TRUING ABRADING WHEELS. Otto H. Collmer of South Bend, Ind. Assignor to Collmer Bros. of the same place. A tool for dressing emery wheels or other abrasive wheels. It is made of a number of corrugated wheels revolving on an arbor and which are pressed against the emery wheel.

969,075, Aug. 30, 1910. BRUSH. Henry Nelson of Cleveland, Ohio. A rotary brush so constructed that the sections may be renewed. The brush has been designed partic-



ularly for use in the removal of scale from metals, and, as the inventor says, has obviated the dangers of the sections becoming loose and injuring the operator and the machinery.

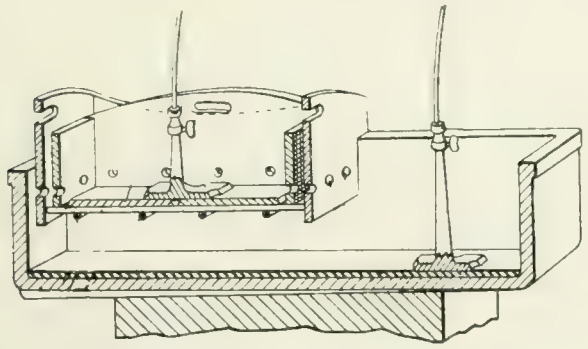
969,796, Sept. 13, 1910. BRUSH FOR DYNAMO ELECTRIC MACHINES. Edward T. Mug of Norwood, Ohio. Assignor to the Bullock Electric Mfg. Co. of the Bullock Electric Mfg. Co., of the same place. A method of making a carbon brush for use on



dynamos. The strands of a copper cable are imbedded in the plastic carbon material before compressing and baking. In this manner the low electrical conductivity of the carbon brush is greatly increased.

970,334, Sept. 13, 1910. MOLDING MACHINE. W. H. Hoffman of Union Hill, N. J. Assignor to Richey, Browne & Donald of Maspeth, N. Y. A molding machine for use on large work such as doors or window frames. It may be used with either wood or metal patterns and applied to a large range of work.

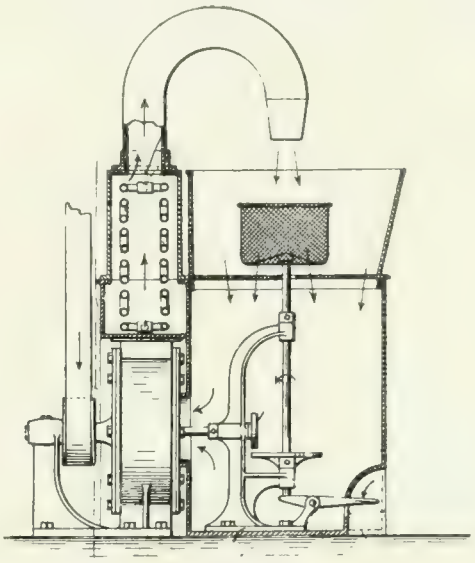
969,921, Sept. 13, 1910. ELECTROLYTIC APPARATUS. Wm. Thum of Hammond, Ind. An apparatus for the saving of gold and silver in the electrolytic refining of these met-



als. The apparatus is in the form of a basket lined with canvas which holds back the slimes and crystals of metals. The construction of the basket is the feature of the invention.

969,109, Aug. 30, 1910. SOLDER FOR INCANDESCENT LAMP FILAMENTS. Hans Kuzel of Baden, Austria-Hungary. Assignor to the General Electric Co., of Schenectady, N. Y. The use of aluminum carbide is claimed as a material for the soldering of the filaments.

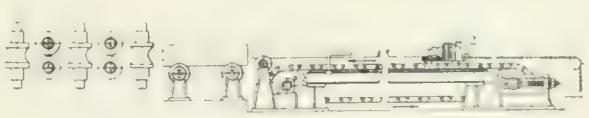
969,453, Sept. 6, 1910. MEANS FOR DRYING JEWELRY, ETC. Francis P. Boland of Providence, R. I. An appliance for drying-out small metal goods after plating, dipping, coloring, etc. The articles to be dried are placed in a basket of wire cloth or similar perforated material, and hung under a pipe



through which hot air is forced by means of a blower. The basket may be revolved, if desired, by pressing a foot lever, thus increasing the rapidity of drying. The basket need not be revolved during the drying, in order to prevent any abrasion of the articles, in case it is necessary.

970,349, Sept. 13, 1910. CRUDE OIL BURNER. Elijah J. Owin of Galveston, Texas. The burner is in the form of a long tube and in which are a series of spoked mangles which serve to break up and mix the gas as it passes along, so that when the oil and air issue from the end, an intimate mixture is obtained with a corresponding improvement in combustion.

970,263, Sept. 13, 1910. ROLLING MILL FOR PRODUCING TUBES. Mathias Peters of Benrath, near Dusseldorf, Germany. A rolling mill for producing tubes from a hollow billet. Its object is to regulate the forward motion of the mandrel so that its speed shall



not exceed that of the rolls. By such a method it is possible to roll long lengths of tubes with short mandrels. The mandrel may also be more readily extracted from the finished tube.

Trade Items.

L. P. Rays is building a new factory in Carthage, N. Y., to manufacture automobile lamp shades.

The Young Safety Razor Co., has been incorporated in Philadelphia, Pa., with a capital stock of $100,000 to manufacture safety razors. The office of the company is at 11th St., and Erie Ave. An electroplating plant will shortly be fitted up.

The Dow Chemical Co., of Mansfield, Ohio, manufacturers of platers' supplies and equipment, have discontinued their Eastern office in Bridgeport, Conn., and will look after the territory from their main office. W. E. Gifford will continue to look after the Eastern trade as usual.

The Abbott Ball Co., 14 Hicks St., Hartford, Conn., manufacturers of steel balls for burnishing small metal goods by tumbling, have appointed Lander & Larsson, 164 Edmund St., Birmingham, England as their British representatives and who will handle their goods in that country. Their new catalogue "C" is now ready for distribution and will be sent to those who desire it.

The Hartman Ingot Metal Co., has been organized in Chicago, Ill., and started smelting works at 2511 West 21st St., for the manufacture of red and yellow brass ingot metal and aluminum in ingot form. The manufacture of ingot metals will be under the personal supervision of Mr. Hartman who has been in the business for the past 10 years. At the present time their product is being sold principally to manufacturers of plumbers' brass goods.

The Housatonic Metal Co., has been organized in Stratford, Conn., and have commenced the manufacture of ingot brass for the trade. The smelting works are located near the depot in that place. Scrap metals will be used in the manufacture of their ingot metals. The company has been organized by C. W. Moore, Bernard S. Judson and others. Mr. Moore is well known in the trade and recently conducted a metal business in Bridgeport, Conn.

The Levett Mfg. Co., 407 Canal St., New York City, manufacturers of electroplating supplies and equipment, announce to the trade that they have purchased the business of the Zucker & Levett & Loeb Co., of New York City, who recently went into bankruptcy. Their purchase comprises the stock on hand, machinery, patents, formulas, trademarks, etc. They will continue to manufacture the following specialties previously made by the Zucker & Levett & Loeb Co.: The Triplex Buff, Silverite and Corrugated Anodes, Rouges and Polishing Compositions. The greater portion of the old employes of the company will remain with the Levett Mfg. Co. The customers will be served as in the past and with the same line of goods.

The Yates-Upholt Brass Co., of Plymouth, Mich., manufacturers of plumbers' brass goods, automobile hardware, etc., are to move their factory to Saginaw Mich., where a new factory is to be built for them.

The plant of the new Dominion Safe & Vault Co., at Farnham, Quebec, Canada, is now in operation and the manufacture of safes and vaults has commenced. This company is affiliated with the Herring-Hall-Marvin Safe Co., of Hamilton, Ohio.

The Glacier Metal Co., of Richmond, Va., with works at Manchester, Va., manufacturers of babbitt-metal, have recently placed on the market a new ribbonized, plastic, metallic packing. It is made of the best grade of white-metal, and is in the form of shreds. It is used for steam, gas and water packing.

The American Manganese Bronze Co., 99 John St., New York City, and with works at Holmesburg Junction, Pa., are sending out a circular to the trade announcing that they are now prepared to make all kinds of brass, bronze and composition castings. They are sending this circular on account of the belief that they make only manganese-bronze castings.

W. J. Abate, general superintendent of the Nathan Mfg. Co., 416 East 106th St., New York City, desires that the attention of the trade be called to the fact that he is not financially interested in the M-R-V Brass Melting Furnace. In an open letter he says the information has been spread abroad that he is interested in the furnace, and it is his desire to deny this assertion. He says he is interested only as a user.

C. J. Moberg of Mt. Vernon, N. Y., manufacturer of die-castings, has moved to his new building on Pearl St. This consists of a new two story and basement brick building, which will give him ample room. In the basement he will install a new and up-to-date electroplating plant to be used in plating die castings of all kinds. He will then be able to turn out the castings for customers in a condition ready for use.

The Reinhold Noflux Aluminum Solder Co., 53 Demarest St., Newark, N. J., announce that they have been obliged to open a branch factory in Germany on account of the demand for their product in that country. It is located in Magdeburg and is in charge of Gustave Reinhold. The president of the company has just returned from a trip abroad and has made arrangements for the factory as well as the establishing agencies in various countries in Europe. The tests that have been made of their solder abroad have been so gratifying that they feel a very large demand will be created in the near future. Many of the leading companies are now using it for repairing aluminum castings and manufacturing aluminum goods.

The American Valve Co., of Coxsackie, N. Y., manufacturers of steam metal valves, are erecting a new power station 60 x 66 feet. A new pattern vault is also to be built.

The McGill Mfg. Co., has succeeded the Crescent Company of Chicago, Ill., manufacturers of lamp guards. The plant is now located in Valparaiso, Ind. The Loxom lamp guard is manufactured.

The new plant of the Davis Safe & Lock Co., at Portland, Oregon is being completed. The office of the company is at 66 Third Ave. This company are now operating an iron and brass foundry in which all their own castings are being made.

The Interstate Mfg. Co., of Oskaloosa, Iowa, are now manufacturing a new device for opening the drafts of a furnace in the morning. It consists of an alarm clock and automatic mechanism, which opens the furnace drafts at a pre-determined time.

A new plant is being equipped for the smelting and refining of gold and silver sweeps at Mulberry and Murray Sts., Newark, N. J., by the Elizabethtown Smelting & Refining Co. The plant of the company at Lyons Farms, N. J., has been sold to the National Products Co., manufacturers of confectioners' supplies.

The Alfred Spice Process, 250 North Fifth St., Philadelphia, Pa., desire to call the attention of the trade to their "A-S-P" Soldering Fluid which, they state, is the one great advance in the soldering industry. It is a heavy, water-white fluid that contains no acid, gives off no fumes and does not rust or corrode metals. It is used in soldering all metals except aluminum. It is not injurious and will not act upon the hands. A free sample will be sent to those interested.

The American Rolling Mill Co., of Middletown, Ohio, manufacturers of sheet iron, claim to have "developed" a new spelter for use in galvanizing that is much superior to ordinary spelter for coating sheet iron in the manufacture of galvanized iron. It is claimed that it will not crack off in double seaming and dissolves more slowly in acids than ordinary spelter. The spelter is not yet on the market but they expect to produce it commercially within a short time. It is undoubtedly a zinc alloy.

The Zucker & Levett & Loeb Co., New York City, manufacturers of plating suplies and equipment, have gone into bankruptcy and Augustus H. Skillin has been appointed receiver. The company has since been sold to the Levett Mfg. Co., as noted elsewhere. The Zucker & Levett & Loeb Co., was one of the oldest concerns in the plating supply business and was originally formed by the consolidation of the Zucker & Levett Company and the Loeb Mfg. Co. Charles A. Loeb then became president. At his death a short time ago, the company was not found to be in as good condition as generally supposed and this finally terminated in application for bankruptcy proceedings.

The electroplating establishment of Otto W. Miller at 220 Eddy St., Providence, R. I., was damaged by fire on Sept. 10th.

The Paye & Baker Mfg. Co., of Attleboro, Mass., manufacturers of sterling silver novelties, are building an addition to the factory. This addition is to be 34 x 48 feet.

A. E. Russ Co., manufacturers of beer pumps and similar goods, will erect a new brass plant at Walworth Ave., near West 58th St., Cleveland, Ohio. They are now located at 6813 Wade Park Ave.

The Tyson Co., of Canton, Ohio, manufacturers of ice-cream freezers, pastuerizers, etc., have incorporated their company for $75,000 and will erect a new plant. A new site has already been purchased for this purpose.

The International Acheson Graphite Co., of Niagara Falls, N. Y., manufacturers of artificial graphite products, have opened a Southern branch in Atlanta, Ga., from which the Southern territory will be looked after.

The Automatic Register Co., of East St. Louis, Ill., and offices in the Metropolitan Building in that city, are to build a new plant for the manufacture of street car registers. A new kind of register is to be made. It indicates the exact amount earned by the car.

The Corbin Screw Corporation of New Britain, Conn., manufacturers of brass and iron machine and wood-screws, have purchased the plant and business of the Mt. Carmel Bolt & Nut Co., of Mt. Carmel, Conn., manufacturers of bolts and nuts. The machinery will be removed to New Britain and the business continued.

The Rockwell Furnace Co., 26 Cortlandt St., New York City, manufacturers of furnaces of all kinds of treating metals, announce to the trade that they have opened a Chicago office in the Fisher Building, Dearborn and Van Buren Sts., Chicago, Ill. This office, which will occupy rooms 718 and 719, will be in charge of A. L. Stevens and who will look after the Western trade.

The new factory of the American Telegraph Typewriter Co., Prospect and Pearl Sts., Brooklyn, N. Y., is now completed and manufacturing commenced. This company reports that it has orders on hand for 5,000 typewriters, and as soon as this order is filled, 10,000 additional machines will be built. The new factory is fire-proof and is operated by electric power.

A new trade publication or "house-organ" called "Philadelphia-Made Hardware" has just been issued and will hereafter be published in monthly numbers. It is published in the interest of The Miller Lock Company, the Henry Disston & Sons Inc., saw manufacturers, North Bros. Mfg. Co., hardware manufacturers, Fayette R. Plumb, Inc., hardware manufacturers, and the Enterprise Mfg. Co., manufacturer of hardware specialties. The publication office is at 925 Chestnut St., Philadelphia, Pa.

The Chatfield Brass & Iron Works of Escanaba, Mich., are to erect a new addition to their new works. It will be 40 x 80 feet. This industry is now one of the most important in northern Michigan.

The International Nickel Co., 43 Exchange Place, New York City, have purchased a site consisting of over 100 acres at Roosevelt, N. J., (near Elizabethport) and will erect a new nickel refining plant upon it.

Attention is called to the fact that the International Chemical Co., of Camden, N. J., are specialists in the cleaning of metals. They do not supply one cleaner for all conditions, but find out exactly what is needed for their work. In this manner platers obtain exactly what is needed for their work.

Voland & Sons, New Rochelle, N. Y., manufacture the highest grade of balances for the chemical, silversmith, and metal trades. They make those from the most sensitive assay balance up to large balances for weighing gold and silver bullion. They were established in 1888. Those who are in the market for fine balances of any kind should send for their catalogue. It will be mailed upon request.

The J. D. Smith Foundry Supply Co., Cleveland ,Ohio, the well known foundry engineers and manufacturers, have appointed Barnes, Edwards & Co., 1001 Arrott Building, Pittsburgh, Pa., agents for them in that territory. They also announce that John H. Morrison, 88 Harbord St., Toronto, Canada, will handle their Canadian trade for them.

Walter Mcleod & Co., Pearl St., and Produce Alley, Cincinnati, Ohio, manufacturers of oil furnace equipment, announce that they have recently taken contracts for a large plate heating furnace for the J. Baum Safe Company of that city, a complete furnace equipment for the Southern Motor Works of Nashville, Tenn., and a complete furnace equipment for the W. H. Clore Mfg. Co., of Washington, Ind.

The Naugatuck Chemical Co., Naugatuck, Conn., are one of the largest concerns in the United States manufacturing acids and heavy chemicals. They are makers of sulphuric acid, nitric acid, muriatic acid, acetic acid, hydrofluoric acid, acetate of lead, aqua ammonia and glaubers salts. The acids they produce are made particularly for the metal trades and are used extensively in the Naugatuck Valley and elsewhere for dipping, pickling, etc.

The Abbott Ball Co., 14 Hicks St., Hartford, Conn., manufacturers of steel balls for the burnishing of metal goods by tumbling, have recently compiled a very interesting and useful booklet on "The New Burnishing Process" describing the method of burnishing small metal goods by tumbling them with steel balls. This booklet gives the necessary information upon the process and every one interested in the polishing of small metal goods should read it. It will be sent free to anyone who desires a copy.

The Holbrook Mfg. Co., of Attleboro, Mass., have commenced the manufacture of silver plated mesh bags.

The Washburne Mfg. Co., has been organized in Syracuse, N. Y., to manufacture radiators, valves, etc. The capital stock is $125,000.

Schwartz & Land, 357 Pearl St., New York City, buy and sell all kinds of electrical instruments, such as volt-meters, ammeters, rheostats, etc. They also buy and sell dynamos and motors of all kinds. When in the market they will be pleased to quote.

The J. D. Smith Foundry Supply Co., of Cleveland, Ohio, have purchased the patents of the Bayer Pattern Plate & Mfg. Co., of that city and will hereafter manufacture their well known match plate composition, and also the combination roll over and squeezer molding machines.

The Leddell-Bigelow Co., 18 Broadway, New York City, manufacturers of white-metals, are sending out to the trade, three booklets as follows: "The Care and Repair of Bearings", "Bee Anti-Friction Metals", and "Sampson Metal." These booklets will be sent to those interested.

T. McAvity & Sons Ltd., of St. Johns, New Brunswick, have obtained a site in Port Arthur, Ont., Canada and will build a new factory there. It is stated that 500 hands will be employed. The plant in St. Johns will also be enlarged. This company manufacture iron and brass valves, and will build a new brass foundry in Port Arthur.

C. J. Moberg of Mount Vernon, N. J., is now manufacturing a particularly high grade die-casting. The castings are made in metal molds under pressure and require no machining. These die castings, he says, have the advantage over others on the market as he guarantees them not to warp, twist or deteriorate.

The Henry Souther Engineering Co., Hartford, Conn., have one of the largest testing laboratories in the United States and number among their customers many of the leading manufacturing concerns. They are specialists in analyzing brasses, bronzes, aluminum-alloys, babbitt-metals, etc. In addition, they have an exceptionally complete physical laboratory in which an Emery testing machine, the most accurate made, is installed and they are prepared to make tensile tests etc., of metals at short notice and with the utmost accuracy.

A. J. Corcoran, Inc., No. 3 John St., New York City, manufactures wood tanks for holding plating or pickling solutions. His acid tanks may be used without lining and this is one of the strong claims that he makes for them. He states that he has been making tanks for 40 years and has never lined an acid tank. Special tanks are made for electroplating, galvanizing, etc. The tanks are made in a special manner and from wood most adapted to the purpose. A full description will be sent upon request.

R. W. Nelons, gold and silver refiner and assayer, has opened an establishment at 735 Sansom St., Philadelphia, Pa.

The new factory of the American Valve & Meter Co., on Spring Grove Ave., Cincinnati, Ohio, is being rapidly pushed and it is expected that it can be occupied before the first of the year.

The Dayton Sure Opener Co., has been incorporated in Dayton, Ohio, with a capital stock of $25,000 to manufacture hardware specialties.

The McShane Bell Foundry of Baltimore, Md., manufacturers of bells, are to enlarge their brass foundry. Operations will not be started before the first of the coming year.

The D. T. Williams Valve Co., of Cincinnati, Ohio, manufacturers of steam-metal valves, have purchased the business of the Bickford Drill & Tool Co., of that city and will extend their business.

The U. S. Indestructible Gasket Co., 50 Church St., New York City, manufacturers of copper and other metal gaskets ,are building a new plant in Brooklyn, N. Y. A floor space 10 x 500 feet will then be had for manufacturing.

The new addition to the plant of the Quad Stove Co., at Columbus, Ohio is now completed. It is to be operated under the name of the Columbus Tinware & Camp Equipment Co. A line of household hardware and camp equipment will be made. The new addition is 58 x 160 feet and two stories high.

John Toothill, Rochelle Park, Bergen County, N. J., has been supplying many of the largest consumers in the country with rolled white metals. He has a modern rolling mill adapted to the rolling of britannia-metal, pewter, block-tin, and other white metals. He established the business in 1859. Casting and rolling of all kinds of soft metals is done for the trade.

The Baird Machine Co., Oakville, Conn., are sending out to the trade Bulletins No. 204 and 205 describing the various new products that have recently been put on the market by the company. The "Baird" double action pillar pattern presses are illustrated and described as well as their sheet metal and scrap reels. The presses possess particular merit and users of presses should write for these Bulletins as they will be sent to any one interested.

The New Haven Sherardizing Co., 1040 State St., New Haven, Conn., are the first to start a Sherardizing plant in the east. Their plant is now in full operation and they are turning out all kinds of work for the trade. The finish is guaranteed to be rust proof and has the advantage over ordinary galvanizing in that the coating is smooth. This allows it to be adapted for many classes of work. The hardware manufacturers are now beginning to use it with excellent results. The New Haven Sherardizing Co., solicit jobbing work of all kinds.

The Arthur Mfg. Co., has started to manufacture cloth buffs at 12 Beverly St., Providence, R. I.

The Vermillion Novelty Company has been incorporated in Vermillion, Ohio, to manufacture metal and wood novelties. The capital stock is $10,000.

Personals.

Percy S. Brown electrochemist for the Western Electric Co., has moved from New York City, to Hawthorne, Ill., where the main plant of the company is located. He will be permanently located at this place.

John H. Robinson has closed his aluminum foundry which he recently started in Bridgeport, Conn., and is now representing the Jonathan Bartley Crucible Co., in New England. He will act as their Eastern travelling representative.

W. R. Dean, who recently resigned his position as foreman of the foundry of the Lumen Bearing Co., of Buffalo, N. Y., has accepted a similar position with the Peck Bros. & Co., New Haven, Conn., manufacturers of plumbers' brass goods.

Lewis D. Beitzel, formerly foreman of the brass foundry of the Watertown Arsenal and later connected with the Crescent Park Brass Foundry of Waltham, Mass., has returned from the Philippine Islands where he has been for some time in the employ of the Government foundries.

Charles L. Gulick, who recently resigned his position with the American & British Company of Bridgeport, Conn., with whom he had been connected for many years in the position of general-manager, is now connected with the Enos Company, Seventh Ave., and 16th, St., New York City, in the same capacity. This company are one of the largest manufacturers of lighting fixtures in the United States.

Obituary.

G. L. Feldman, secretary of the Hanson & Van Winkle Co., of Newark, N. J., died on Sept. 16th, at his home. Mr. Feldman had been associated with the company for thirty-five years and had grown up with it. He was widely known in all parts of the United States in which he travelled and was a man in whom the greatest confidence was placed.

Chester F. Wickwire, president of Wickwire Bros., of Cortland, N. Y., manufacturers of steel and copper wire and wire cloth, died on Sept. 14th, at the age of 67. He was the founder of the company and built it up from its beginning as a hardware store. The foundation was an old loom bought for junk, and which he repaired and used for weaving wire. From this meagre beginning he built up a very large industry which now even produces its own pig-iron for the manufacture of their steel.

Current Metal and Supply Prices.

These Prices are net and are for moderate quantities. Smaller quantities command higher prices. Prices subject to fluctuation.

Acetone, pure, 98-99%	lb.	.22
Acid, Acetic, pure, 30%	lb.	.07
Acid, Arsenious (White Arsenic)	lb.	.20
Acid, Benzoic	lb.	.55
Acid, Boracic (Boric), pure	lb.	.12
Acid, Hydrochloric, see Acid, Muriatic.		
Acid, Hydrofluoric, 30%	lb.	.04
Acid, Hydrofluoric, 50%	lb.	.10
Acid, Muriatic, 20°	lb.	.02
Acid, Muriatic, c. p., 20°	lb.	.07
Acid, Nitric, 38°	lb.	.05⅝
Acid, Nitric, 40°	lb.	.05⅞
Acid, Nitric, 42°	lb.	.06¼
Acid, Nitric, c. p.	lb.	.08
Acid, Sulphuric, 66°	lb.	.01¾
Acid, Sulphuric, c. p.	lb.	.06
Alcohol, Wood	gal.	.50
Alcohol, Denatured	gal.	.55
Alum	lb.	.04
Ammonium Sulphate	lb.	.06
Aluminum, Metallic, in Ingots	lb.	.22
Aqua-Fortis, see Acid, Nitric.		
Ammonia Water (Aqua-Ammonia), 20°	lb.	.04¾
Ammonia Water (Aqua-Ammonia), 26°	lb.	.06¼
Ammonia Water, c. p.	lb.	.08
Ammonium Carbonate, lump	lb.	.15
Ammonium Chloride (Sal-Ammoniac)	lb.	.12
Ammonium Hydrosulphuret	lb.	.30
Ammonium Sulphate	lb.	.07
Ammonium Suphocyanate	lb.	.50
Amyl Acetate	gal.	1.85
Antimony	lb.	.08¼
Arsenic, Metallic	lb.	.15
Arsenic, White (Acid Arsenious)	lb.	.20
Argols, White (Cream of Tartar)	lb.	.31
Asphaltum, Commercial	lb.	.05
Asphaltum, Egyptian (Bitumen)	lb.	.30
Benzine	gal.	.15
Benzol, Pure	gal.	.75
Bismuth, Metallic	lb.	1.95
Bitumen, see Asphaltum.		
Blue-Vitriol, see Copper Sulphate.		
Borax, Crystals or Powdered	lb.	.10
Borax Glass	lb.	.35
Cadmium, Metallic	lb.	.70
Carbon Bisulphide	lb.	.10
Calcium Carbonate (Precipitated Chalk)	lb	.10
Chrome-Green	lb.	.50
Copper, Lake, (carload)	lb.	.12⅞
Copper, Lake, (cask)	lb.	.13⅛
Copper, Electrolytic, (carload)	lb.	.12⅝
Copper, Electrolytic, (cask)	lb.	.12⅞
Copper, Casting, (carload)	lb.	.12½
Copper, Casting, (cask)	lb.	.12¾
Copper Acetate (Verdigris)	lb.	.35
Copper Carbonate, dry	lb.	.25
Copper Sulphate (Blue-Stone)	lb.	.09
Copperas, see Iron Sulphate.		
Corrosive Sublimate, see Mercury Bichloride.		
Cream-Tartar, see Potassium Bitartarate.		
Cryolite	lb.	.12
Cyanide, see Potassium Cyanide.		
Dextrin	lb.	.15
Emery Flour	lb.	.04
Emery, F F & F F F	lb.	.03
Flint, powdered	lb.	.01
Fluor-Spar	lb.	.01¼
Fusel-Oil	gal.	1.75
Gold Chloride	dwt.	.60
Gum Copal	lb.	.30
Gum Guiacum	lb.	.26
Gum Mastic	lb.	.70
Gum Sandarac	lb.	.35
Gum Shellac, brown	lb.	.50
Gum Shellac, white	lb.	.60
Iron Perchloride	lb.	.25
Iron Sulphate (Copperas)	lb.	.05
Lead Acetate (Sugar of Lead)	lb.	.15
Lead, Pig	lb.	.04½
Lead, Red	lb.	.12
Lead, Yellow Oxide (Litharge)	lb.	.12
Liver of Sulphur, see Potassium Sulphide.		
Manganese, Ferro, 80%	lb.	.10
Manganese, Metallic, pure	lb.	.75
Magnesium, Metallic	lb.	1.50
Mercury Bichloride (Corrosive Sublimate)	lb.	.93
Mercury, Metallic (Quicksilver)	lb.	.46
Mercury Nitrate	lb.	1.50
Mercury Oxide, yellow	lb.	1.80
Nickel and Ammonium Sulphate (Double Salts)	lb.	.16
Nickel Carbonate, dry	lb.	.60
Nickel Chloride	lb.	.50
Nickel Metallic	lb.	.47
Nickel Sulphate (Single Salts)	lb.	.25
Nitre (Saltpetre), see Potassium Nitrate.		
Oil of Vitriol, see Acid, Sulphuric.		
Paraffine	lb.	.15
Phosphorus, yellow	lb.	.40
Phosphorus, red	lb.	1.10
Pitch	lb.	.05
Plaster of Paris, Dental	bbl.	4.00
Platinum Chloride	oz.	20.00
Platinum Metallic	oz.	37.50
Potash-by-Alcohol, in sticks	lb.	.50
Potash, Caustic (Potassium Hydrate)	lb.	.08
Potassium Bichromate	lb.	.14
Potassium Bitartarate (Cream of Tartar)	lb.	.31
Potassium Carbonate (Pearlash)	lb.	.10
Potassium Chlorate	lb.	.15
Potassium Cyanide	lb.	.25
Potassium Iodide	lb.	2.25
Potassium Nitrate (Nitre or Saltpetre)	lb.	.10
Potassium Permanganate	lb.	.17
Potassium, Red Prussiate	lb.	.60
Potassium, Yellow Prussiate	lb.	.24
Potassium Sulphide (Liver of Sulphur)	lb.	.15
Potassium Sulphuret, see Potassium Sulphide.		
Potassium Sulphocyanate	lb.	.70
Pumice, Ground	lb.	.05
Quartz, Powdered	lb.	.01
Rosin, Yellow	lb.	.04
Sal-Ammoniac, see Ammonium Chloride.		
Sal-Soda, see Sodium Carbonate.		
Silver Chloride, dry	oz.	.75
Silver Cyanide	oz.	1.00
Silver, Fine	oz.	.53¾
Silver Nitrate, crystals	oz.	.50
Soda-Ash	lb.	.05
Sodium Biborate, see Borax.		
Sodium Bisulphite	lb.	.15
Sodium Carbonate (Sal-Soda), crystals	lb.	.02
Sodium Hydrate (Caustic Soda)	lb.	.05
Sodium Hydrate (Caustic Soda) by Alcohol (in sticks)	lb.	.45
Sodium Hyposulphite ("Hypo")	lb.	.04
Sodium Metallic	lb.	.90
Sodium Nitrate	lb.	.05
Sodium Phosphate	lb.	.09
Sodium Silicate (Water-Glass)	lb.	.04
Soot, Calcined	lb.	.15
Spelter, see Zinc.		
Sugar of Lead, see Lead Acetate.		
Sulphur (Brimstone) in lump	lb.	.05
Tin Chloride	lb.	.43
Tin, Metallic	lb.	.35⅝
Turpentine, Venice	lb.	.35
Verdigris, see Copper Acetate.		
Water, Distilled	gal.	.15
Water-Glass, see Sodium Silicate.		
Wax, Beeswax, yellow	lb.	.45
Wax, Carnauba	lb.	.70
Whiting (Ground Chalk)	lb.	.02
Zinc Carbonate, dry	lb.	.19
Zinc Chloride	lb.	,12
Zinc, Sulphate	lb.	.06
Zinc, (spelter)	lb.	.05¾

THE

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AND

PLATERS' GUIDE

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Brass Plating by the Fire Method.

We regret to say that brass plating by the fire method has not yet arrived at a state of perfection that warrants its use in a commercial manner. This method of plating has always been attractive, and since the advent of the automobile the interest in it has very greatly increased.

The process has long been known, and various patents have been taken out from time to time for methods of accomplishing the process. As far back as 1832, one S. Booth of Berlin, Conn., was granted a patent for bronzing cow bells, and numerous other patents were taken out later upon the same subject. In these processes the bells, made of sheet iron, were heated with brass and borax and the brass spread over the surface. Many such cowbells can now be found and the brass coating will always be found quite imperfect.

Later processes for brass plating by the fire method have been based upon the dipping of the article in molten brass covered with a flux. It is worthy of more than passing mention that in the early days of the manufacture of bicycle tubing, a type called "clincher tubing" was made. This was formed of sheet steel and a saw-tooth joint made where the edges came together. The tubing thus formed was dipped into a pot of molten brass (scrap brass sheet was used) covered with a layer of boracic acid. The brass covered the steel both inside and outside. The outside was then polished off, but the inside could

not be thus treated so that it was left on and the claim made that it acted as a protection against internal rust. As far as the trade was concerned it was believed that the inside was coated purposely.

The difficulty that has been experienced so far has been the production of a uniform brass coating on the iron or steel and one of sufficient thickness. By the use of a suitable flux on the brass when the iron or steel is dipped, the brass coating comes out smooth, but it seems to be difficult to prevent the formation of a thick drop on the portion coming out last. It may be possible by regulating the heat carefully and not removing the article too slowly, to obtain fairly goods results.

There is a demand for a heavy brass deposit on iron or steel goods at the present time. Producing heavy electrodeposits seems to be too costly. Could a satisfactory coating be obtained by dipping, similar to that obtained in dip tinning, it would find ready sale. So far it does not appear to have been done.

Nickel Plating Die Castings.

Now that die castings are beginning to be extensively used, platers are called upon to nickel plate them. Owing to a misunderstanding of the nature of the metal, errors are frequently made and a poor job results. It should be borne in mind that the greater part of the die castings now made contain zinc as the principal ingredient. In plating them, they should be treated like a zinc casting and flashed in a cyanide copper or brass solution previous to nickeling. Care must be taken in cleaning too, as the castings oxidize readily when exposed to the air. Scouring is frequently necessary in case the surface is not bright.

The average composition of die castings is as follows:

Zinc	75%
Tin	15%
Aluminum	5%
Copper	5%

It will be seen, therefore, that in addition to the zinc, aluminum is present, but in an amount sufficiently small to prevent its having much influence on the plating. The fact that zinc is the main constituent is the chief obstacle, and if the castings are plated with the knowledge that they are of such a composition, no difficulty should be experienced.

What to do With Scrap Copper Wire in the Copper Wire Mill.

While copper wire manufacturers have succeeded in reducing the amount of scrap made in their rolling mill to a very small amount, yet the tonnage of wire produced is so large that quite a quantity of scrap is daily produced and it has always been a problem to know what to do with it. To sell it as scrap metal means considerable loss.

Nearly all of the largest producers of copper wire have "taken the bull by the horns" and erected copper refining furnaces for treating the scrap. By means of such refining furnaces it is possible to change it back into good wire bars again which are rolled into wire along with those obtained from the regular copper producer. It is about the only solution of the problem that can be made so as to give the full value of the metal. Small mills, which have limited quantities of scrap, cannot afford to maintain such a furnace and they are obliged to sell the copper scrap for what they can obtain.

The question seems to be arising among such small mills as to whether they cannot refine their scrap in a modest manner so as to put it into ingots and sell on the market at the regular ingot copper price. In this connection it should be understood that the simple melting of the scrap copper wire will not suffice. When it is done and the metal poured into ingots, the oxygen absorption during the melting is such that the surface of the ingots will "rise" and the copper itself will be more or less brittle. In order to refine it properly the copper must be melted and then "poled" with a green wood pole to bring back the "pitch." When this has arrived, the copper may be ladled into ingots which will remain level on the surface.

In case the erection of a refining furnace is out of the question, the best alternative is to cabbage the wire and sell it. Copper wire in cabbaged form always brings a greater price than loose material. In fact, it will bring very close to the ingot price.

The chief error made by brass founders in the manufacture of phosphor-bronze is in the use of too much phosphorus. It causes pinholes and tin spots in the castings.

Sherardizing Small Metal Goods in a Connecticut Plant.

The advantage of a zinc coating for the preservation of iron or steel against rust has now become so well established that it may rightly be termed the *best* protection. Unlike paints, enamels, and similar coatings, zinc serves a two-fold purpose: First, it acts as a simple covering. Second and more important, it is electrochemically positive to iron so that when any corrosion takes place, such as that brought on by exposure to damp air or sea-water, the zinc corrodes in preference to the iron or steel. This corrosion will follow indefinitely until all the zinc has been corroded when the iron or steel will be attacked. The duration of the protection depends upon the character of the coating (*i. e.* whether every portion of the surface is covered) and its thickness.

For the benefit of those who are not yet familiar with the process or definition of "sherardizing," let it be said that it is simply a name for a zinc coating. There is nothing new about coating iron or steel with zinc; but in the sherardizing process, it is applied in a novel manner. The articles to be coated with the zinc are placed in a steel drum, such as those shown in Fig. 1, together with a quantity of zinc dust. The drum is then placed in a furnace and heated to a temperature slightly below the melting point of zinc. This temperature is usually about 700° F. The drums are either very slowly rotated continuously, or turned from time to time. The continuous rotation by means of a worm gear outside of the furnace is the most satisfactory method as it dispenses with hand labor and eliminates

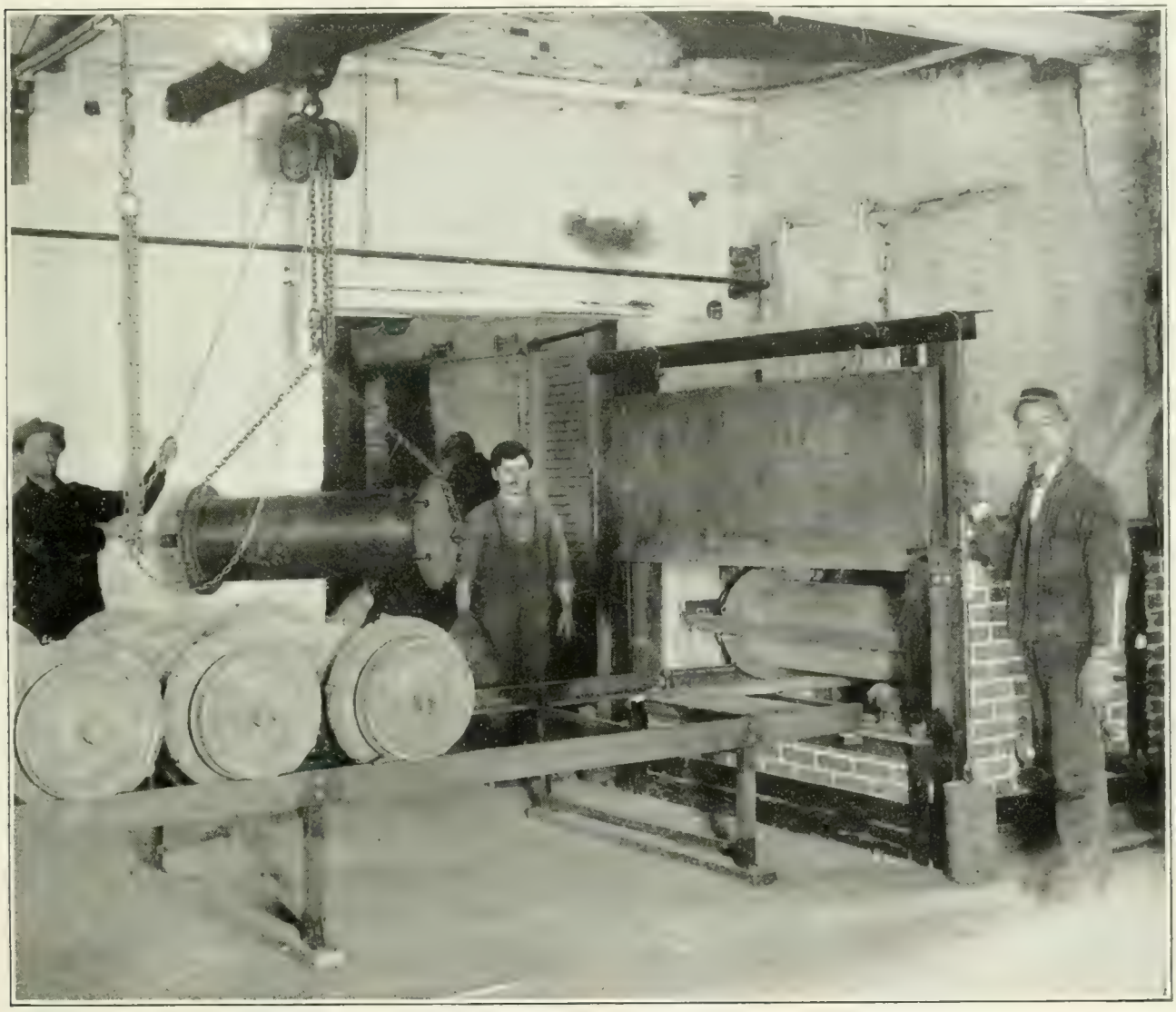

Fig. 1. Interior of the Plant of the New Haven Sherardizing Co., New Haven, Conn., Showing Interior of the Furnace and Drums in Which the Articles and Zinc Dust are Placed.

the item of forgetfulness on the part of the furnace operator. The drum is allowed to remain in the furnace from 4 to 5 hours when it is removed, allowed to cool and the contents dumped. The zinc dust is then riddled out and the operation is finished.

The length of time that the articles are heated in the zinc dust determines the thickness of the coating. Some classes of goods can be treated in less time than others and this is true in the case of small work in which the minimum time only is consumed. The coating, whether thin or thick, is smooth and uniform, and in this respect is unlike the rough, crystalline surface of hot galvanized articles.

use for many purposes. The method of carrying out the process is simple. Small metal goods that are made of bright iron or steel and are free from rust require no preliminary treatment. Such articles as wood screws, wire nails, staples, hooks, machine screws, wire chain etc., which are invariably bright and clean are placed in the cylinder with the zinc dust without any previous treatment. Articles that are rusty or covered with scale must have it removed by pickling or sand-blasting. Sand-blasting is always preferable as it leaves the surface in a better condition and should be used whenever possible. Small goods, which are expensive to treat by sand-blasting, will

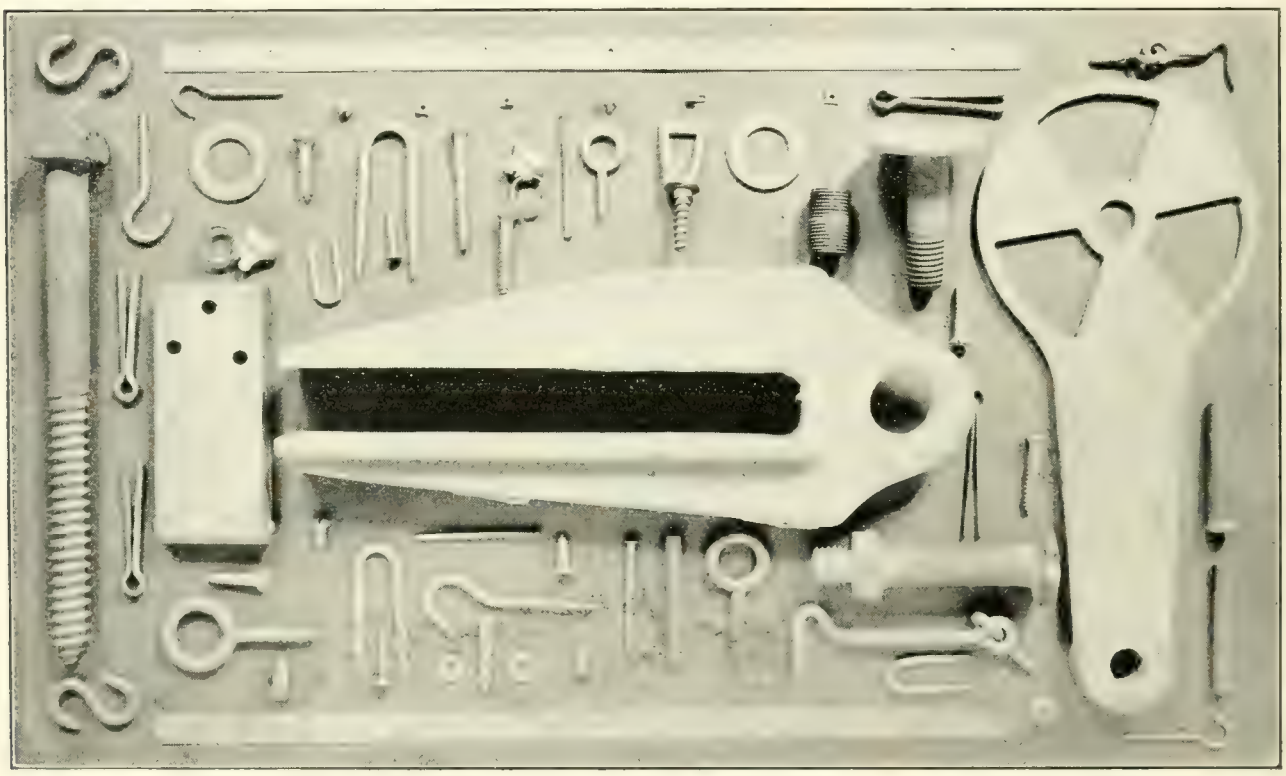

Fig. 2. Variety of Articles Sherardized by the New Haven Sherardizing Co., New Haven, Conn.

Sherardizing is the invention of the now celebrated inventor, Sherard O .Cowper-Coles of London, England. His patent upon the process was granted in 1902, and it was a number of years after it had been granted before any progress was made in applying the process in a commercial manner. Cowper-Coles has been a prolific inventor, and it is said that the number of patents granted to him is only second in number to those granted to Edison.

The advantage of sherardizing lies in the production of a smooth, heavy coating. While in hot galvanizing a heavy coating is obtained, it is rough and crystalline. This precludes its

have to be pickled. In either case, the rust and scale must be removed or the zinc will not adhere to the metal. Small goods may also be cleaned by tumbling with sand, but the cleaning feature is well understood and needs no comment.

When the articles have been cleaned they are placed in a sheet iron or steel drum as shown in Fig. 1. These drums are made of sheet metal riveted to form the cylinder and having cast iron flanged ends upon which caps are bolted. These caps as well as the flanges are faced off so that a tight fit is produced, and a vent hole is left in one end so that any pressure that may be formed in the drum during

the heating, is relieved. The drums are then placed in the furnace shown in Fig. 1. This furnace is heated by gas jets arranged in rows across the furnace and under the drums. No pressure is used in burning the gas so that not only is the operation greatly simplified but is made noiseless. The furnace is supplied with a pyrometer so that the heat may be carefully regulated. This point requires careful attention otherwise the zinc may melt when the temperature becomes too high. If too low, the coating does not take place. The use of a pyrometer with the voltmeter register on the wall near the furnace, however, simplifies the process so that with a little attention everything follows smoothly.

The fact that the temperature of the furnace does not reach a red heat, serves to prolong the life of all apparatus used in the process. The furnace does not burn out like those used for melting or annealing and the drums last for a long time. These features render the maintenance cost very low.

The zinc dust used in the process is a cheap article and costs but little more than slab zinc. At the present time it is all imported, as there is no zinc smelter in the United States who makes it. The demand for the dust previous to the advent of the sherardizing process was small and confined to chemical operations so that it was all produced abroad where the chemicals, for which it was used, were manufactured. It is probable that as soon as a sufficient demand is created for the zinc dust, zinc smelters in this country will produce it as there is no secret or patent upon its manufacture.

When the drums containing the article and zinc dust have been heated a sufficient length of time, they are pulled out of the furnace on the track, shown in the foreground of Fig. 1, and allowed to cool so that they can be handled. They are then hoisted by a chain block and run over to the dumping bin when the contents are dumped into a riddle. The zinc dust passes through and is used over again, and the articles remain in the riddle. If a particularly bright surface is desired, they are tumbled for a short time to remove any adhering zinc dust . This final operation, however, is not imperative but greatly enhances the appearance.

The plant herewith illustrated is that of the New Haven Sherardizing Company, 1040 State St., New Haven, Conn. It has been started to take care of the New England trade and is now in full operation. A general line of jobbing work is carried on. The success that has followed the installation of the plant is illustrated by the samples of work that have been done by them up to the present time. In Fig. 2, the large variety of sherardized work is shown. Some of it is of a difficult character, but they have succeeded in overcoming the difficulties that beset the early users of the process so that uniformity is invariably obtained.

Notes on the Heat Black Finish.

The heat black finish described in THE BRASS WORLD, July, 1910 page 245, has proved to be one of the most satisfactory and durable blacks for brass known. It is easily applied and clings tenaciously to the base metal. Like all good processes, it requires care in its manipulation in order to obtain satisfactory results, but nothing more than ordinary skill is required. As it has been found that many persons have not succeeded in producing a satisfactory black on account of faulty preparation of the nitrate of copper and nitrate of silver, additional instructions may not be inopportune.

The chief error that operators make in carrying out the process is in having free acid in the nitrates of silver and copper used. When this is done, the acid attacks the brass when the solutions are applied, and a frothing takes place with the resulting rough and imperfect surface. In order to work well, the nitrates should be perfectly neutral.

To make the neutral nitrates, all the metal that will be taken up must be dissolved in the acid. To accomplish this the acid is allowed to act upon the metal until there is no further dissolving action. Then see that there is considerable metal left. Now warm gently for some time and a neutral nitrate will be obtained. It is necessary to warm the solution in order to finish the dissolving as the action is not complete in the cold unless the solution is allowed to stand a long time.

Be sure that there is no free acid in the nitrates of copper and silver used and no difficulties will be encountered. When this is done the process is very easily applied.

Reduction of Tin-Dross in an Electric Furnace.*

By R. S. Wile.

Electrical heat was resorted to for the smelting of tin dross because of the fact that the heat could be internally applied to the slag, which is on the bottom of a shaft-type of furnace, thus enabling the dross to be thrown on top of the slag instead of being mixed with it as is done in the old style of furnace. The dross, being on top, comes in contact with the slag only at the point of reduction. The liberated gases filter through the dross, while any tin oxide which is volatilized is condensed in the colder portion of the dross, which, as I have said, is on top of of the slag. The globules of tin produced in smelting pass downward through the slag and lose most of the impurities, so very little refining of the resultant product is necessary.

In operation, the top carbon, which is movable, is brought into contact with the lower carbon, which is stationary, and an arc formed. The slag is fed in and melted, and the carbon is raised until the desired amount of slag is added. The dross, mixed with the right percentage of carbon, is added, and the tin tapped from the bottom from time to time. The loss of tin has been kept as low as 0.25 per cent. and the average below 1 per cent. The amount of tin recovered varies largely on account of the varying percentages in the drosses treated. The average is about 2,500 pounds (1,100 kg.) per day.

The plant consists of two furnaces, connected in series, both being 20 inches (50 cm.) in diameter and 80 inches (200 cm.) high inside, two 50 kw. transformers and necessary electrical apparatus. In operation they consume about 44 kw. During the run it is desired to keep the amperage as near constant as possible, the voltage varying. At the start the voltage of each furnace is about 80, but towards the end, the slag becomes less refractory, due to the combination of the iron and zinc of the dross and the slag, the voltage of each furnace will drop as low as 45-50. This and an analysis of the slag denote the end of the operation, and the slag must be drawn out and new put in. This is done alternately with each furnace. The furnaces run continuously until time to be relined, which is about every three or four months.

*Read at the meeting of the American Electrochemical Society held in Chicago, Ill., Oct. 13-15, 1910.

The "Schoop" Metallizing Process.

In a communication recently made to the Zürich Association of Engineers and Architects, Herr Schoop describes a new process of coating articles with metal (preferably liquid, and at a high temperature) by the aid of centrifugal force, the metal being applied in a very finely divided state. The most suitable method of pulverizing the metal consists in allowing it to escape from the crucible as a thin stream, against which impinges a jet of compressed air or steam. This treatment causes the production of a cloud or mist of the metal, and the articles to be coated are exposed in this cloud for one to three seconds. The high force and velocity with which the particles of metal strike against the surface of the article cause them to spread out and adhere firmly thereto with great tenacity, the specific gravity of the coating approaching that of the normal metal. Notwithstanding the heat of the stream of metal, the zone of metallic fog has a relatively low temperature, so that articles of comparatively low melting points, and even paper and celluloid, may be coated. Tests performed at the Zürich polytechnic school show that the hardness of the metallic coating, under the Brinell test, is greater than that of metallic deposits produced by other means—a fact of importance in the production of printing blocks, &c.; whilst the microscopic examination shows that, in fineness of structure, the deposit is equal to that obtained by other processes. When metallic surfaces are to be coated, it is advisable to cleanse them thoroughly of dust or scale by the sandblast or by pickling, and to warm them before or during the exposure to the depositing zone, though an anticorrosive deposit of tin, zinc, or lead can be produced on iron surfaces without such heating being required.—*The Ironmonger.*

Cast-iron or malleable-iron that has been sand-blasted instead of pickled to clean the surface, gives much better results in electroplating as there is less liability to spot-out. Many platers have now abandoned the pickling on this account.

The New Edison Storage Battery and the Part that Electroplating Plays in Its Manufacture.

Up to the time that the Edison storage battery was first placed on the market, the only one in actual use was the well known type composed of lead plates filled with the active material (usually lead peroxide and spongy lead) and employing dilute sulphuric acid as the electrolyte. Such storage cells have always been open to a number of objections. One of the most unsatisfactory features is their excessive weight so that their employment for the propulsion of vehicles has necessitated the use of a corresponding heavy construction in the vehicle to carry the

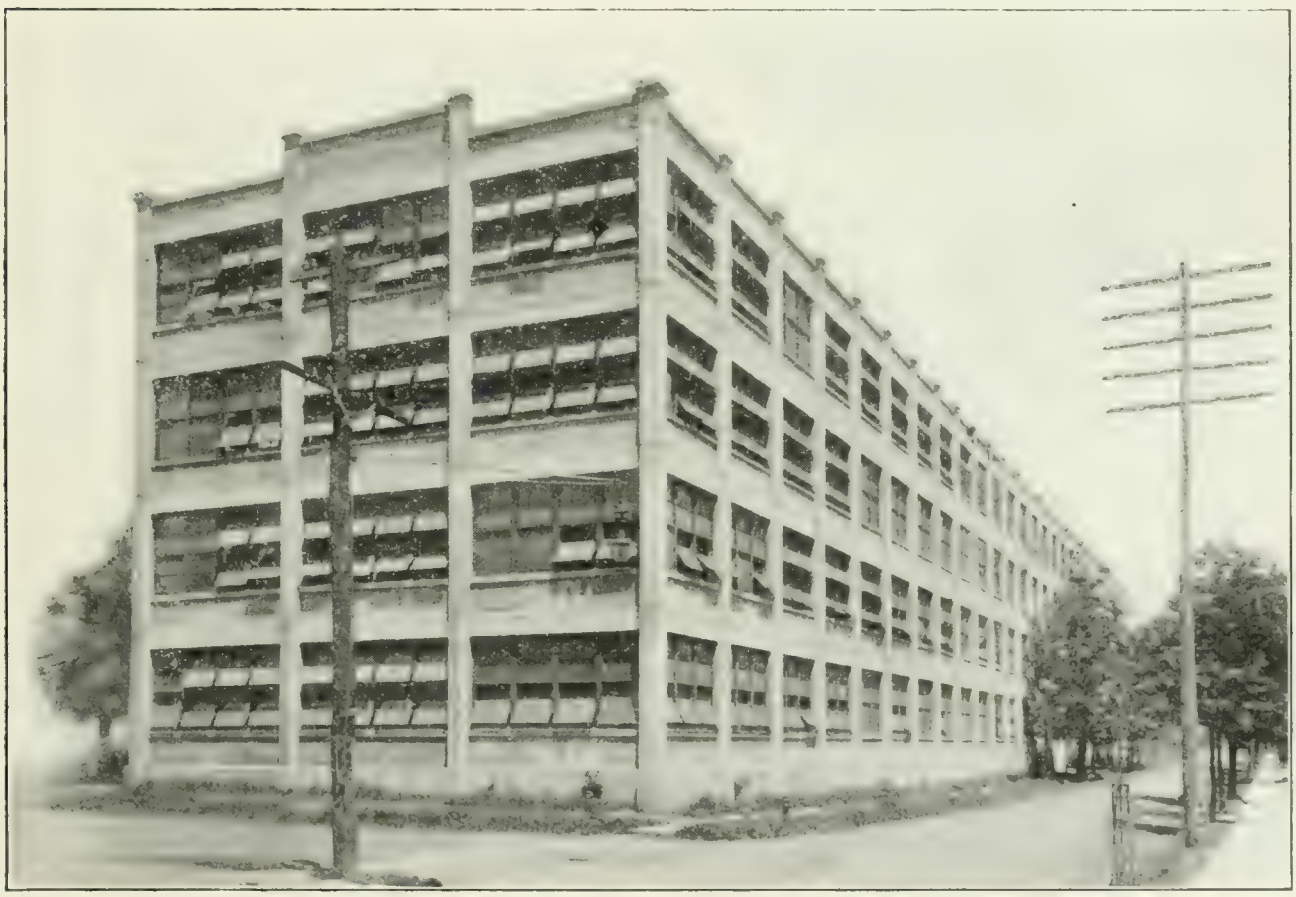

Fig. 1. Plant of the Edison Storage Battery Co. at Orange, N. J. in Which the Complete Storage Battery is Manufactured.

batteries. On account of the need for reducing the weight of the batteries in an electric vehicle to the lowest possible limit, the radius of action has been quite limited. To obtain a large radius of action it would be necessary to store up, in the cells on a vehicle, such a quantity of current that the weight would be so excessive as to prevent its being carried.

Another objectionable feature of the lead storage cell is the fact that sulphuric acid is used as the electrolyte. This precludes the use of any metallic container. Either glass or hard rubber must be employed. Glass is quite suitable for cells to be used in a stationary equipment, but for portable batteries hard rubber must be used. This is not only costly but fragile and more or less short lived. Again, the lead cell is injured to a greater or less extent by overcharging or allowing to remain fully discharged.

Early appreciating these objections, Edison set himself at the task of improving the storage battery so that not only could a cell be greatly reduced in weight for a given output of current, but also to eliminate the use of an acid electrolyte so that a metallic container could be employed. The storage battery problem has always been an attractive one, and many years ago he began his first experiments in the endeavor to overcome the objectionable features of the lead cells. Six years ago the first Edison storage battery was launched and it was the best that had yet been made. Many electric vehicles are yet running

with this early battery and it has proven all that was claimed or expected of it. These results would have been satisfactory to anyone but Edison, but seeing an enormous future ahead, he found that the battery could be improved and decided to start fresh and

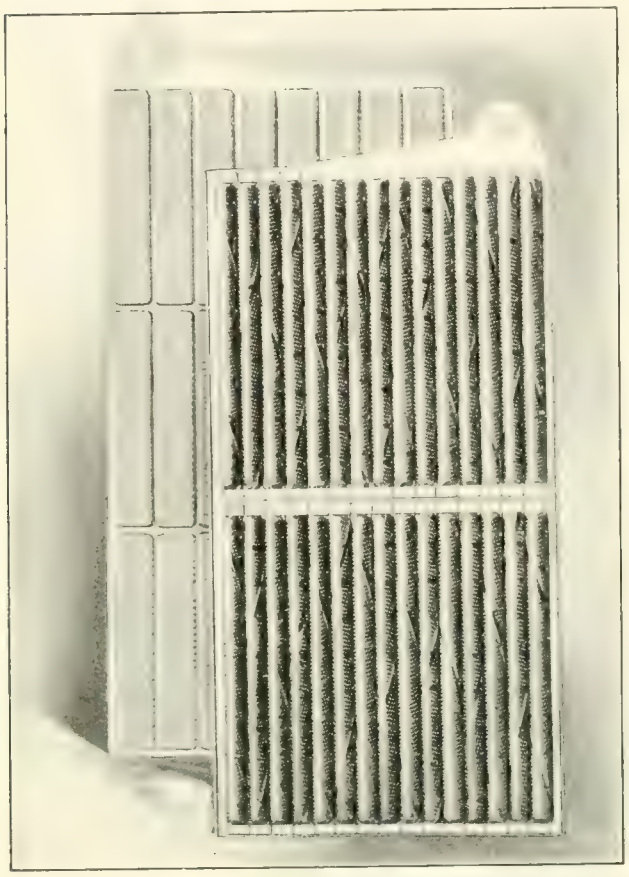

Fig. 2. The Positive and Negative Plates of the Battery.

work from the beginning again. All batteries were withdrawn from the market. The machinery was abandoned and the factory was closed. A new series of experiments were begun and for nearly six years he labored to produce the battery in its present form. It is but a short time ago that he felt he could conscientiously place the battery upon the market, and true to the man, the public has benefitted by it. In doing so, the public is not asked to conduct any experiments, nor assume any risk. All the fine details have been thoroughly worked out and the battery is now in a completed condition. Until this condition arrived ,Edison would not place his battery on sale. A four story concrete building containing 200,000 square feet of floor space is now in operation in Orange, N. J., and is devoted exclusively to the manufacture of the battery. This factory is shown in Fig. 1.

The Edison storage battery cell as now constructed consists of a group of positive and negative plates supporting the active material, and contained in a sheet steel can. The electrolyte is a 21% solution of caustic potash. The positive plate or electrode is a grid of nickel plated sheet steel containing thirty tubes filled with a mixture of flake nickel and nickel hydroxide. These tubes are made of very thin sheet steel, perforated and nickel plated. Each tube is reinforced and protected by small ferrules. The negative plate is composed of twenty four flat, rectangular pockets supported in a nickel plated grid. These pockets are made of thin sheet steel and nickel plated. Each pocket is practically the same composition as the well known iron rust. In this negative plate, each pocket is subjected to a heavy pressure so

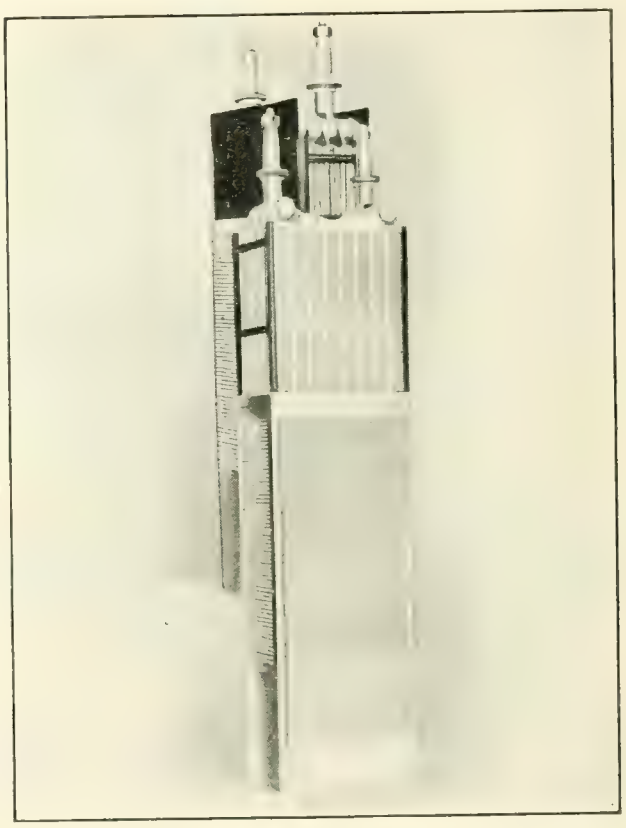

Fig. 3. The Complete Storage Battery Showing the Nickel Plated Steel Container.

that it becomes practically integral with the grid supporting it. In Fig. 2 the positive and negative plates are shown. In the foreground, the positive plate is shown. This is the one composed of the nickel flakes and nickel hydroxide. The one in the background is the negative or oxide of iron plate.

The manufacture of the thin, nickel flakes was early one of the problems of Edison, as it was found necessary to hold the nickel hy-

droxide in its place. Metallic nickel in any other form either did not present the requisite surface, or could not be held in place in the grid. The large number of patents granted to him indicate the evolution of the process of making these flakes. After much experimenting the following method was adopted: A special cylinder is electroplated alternately with nickel and copper so that layers of each metal are obtained. The apparatus used for electroplating the cylinders is shown in Fig. 4. The cylinders are rotated while the electrodeposition is being carried on so as to allow

solved leaving the nickel in the form of very thin flake metal. The object of making such extremely thin nickel is to expose the maximum amount of surface, when used in the positive battery plate, and still have the lightest possible condition. When the copper has all been dissolved away, and the thin flake metallic nickel is left, it is washed with pure water and dried before inserting in the tubes to make the positive plates. The nickel hydroxide is made by precipitating nickel sulphate with caustic soda or caustic potash in the regular method known to chemistry.

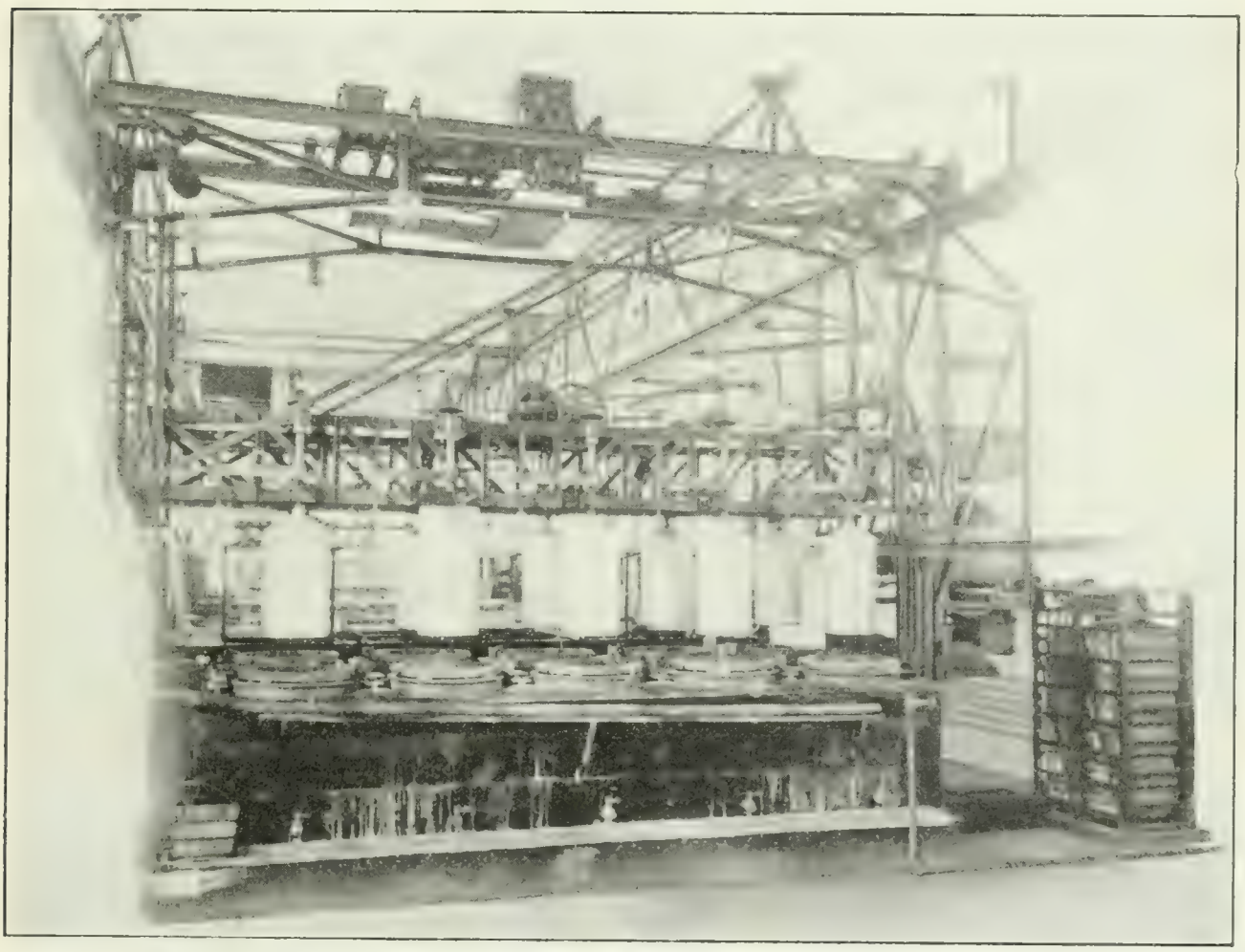

Fig. 4. Apparatus Used in Electroplating the Cylinders Alternately with Nickel and Copper.

a greater current density to be maintained with its accompanying greater rapidity of deposition. In addition to this feature, the cylinders are raised by a travelling crane so that they may be rinsed and then transferred from the nickel to the copper solution and back again.

When the desired number of layers of nickel and copper have been deposited, the cylinders are transferred to the tanks shown in Fig. 5. In these tanks the copper is dis-

The oxide of iron used in the negative plate is obtained in the regular chemical method and presents nothing novel.

In the production of the steel cans for containing the positive and negative plates and the electrolyte, the hand of Edison has again been brought into play. This can is shown in Fig. 3 (together with the plates) and is made of sheet steel corrugated as shown in order to strengthen it. The seams are welded by means of the oxyacetylene blowpipe in the

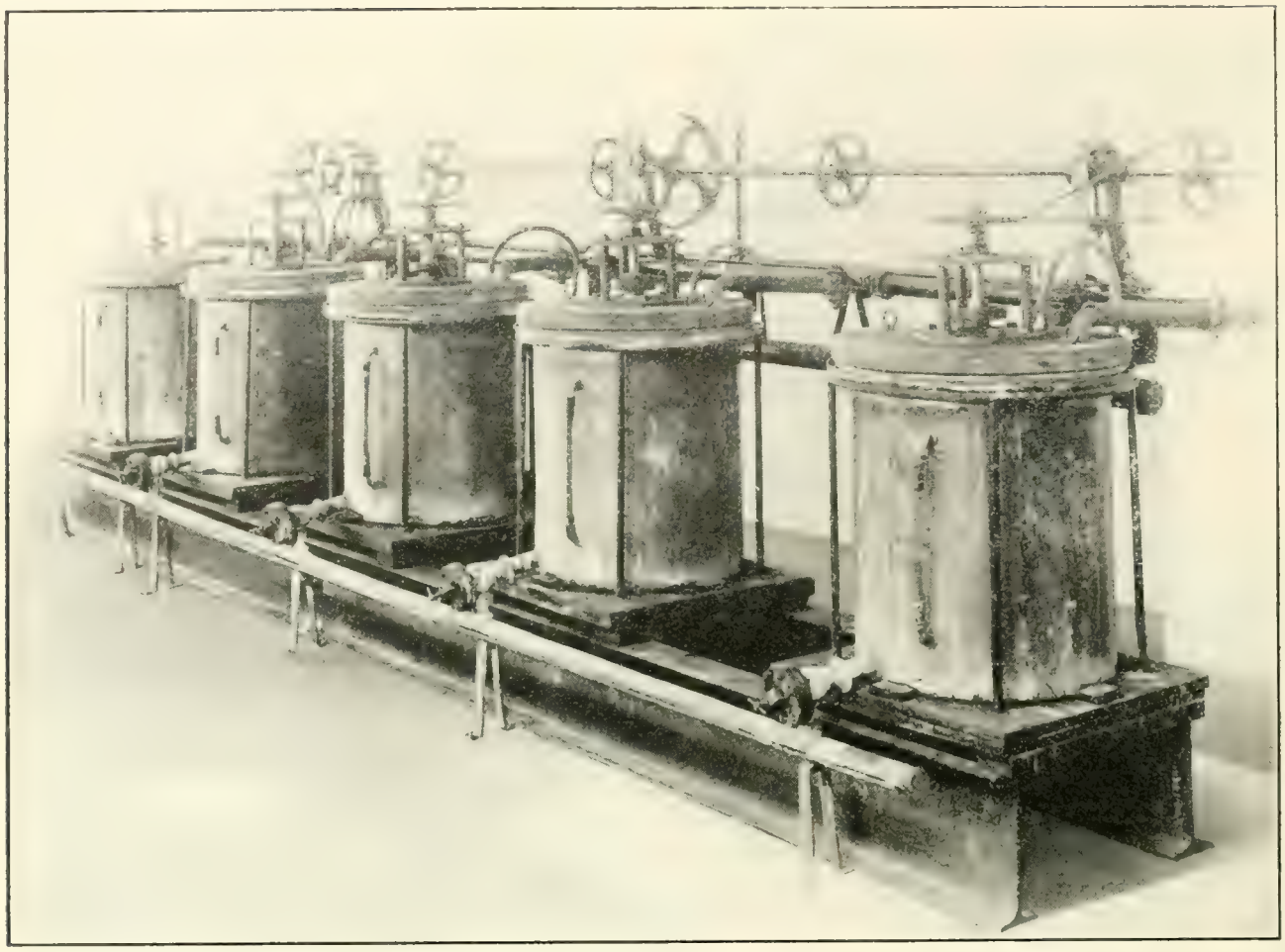

Fig. 5. Tanks Used for Dissolving the Copper from the Electroplated Cylinders, Leaving the Flake Nickel.

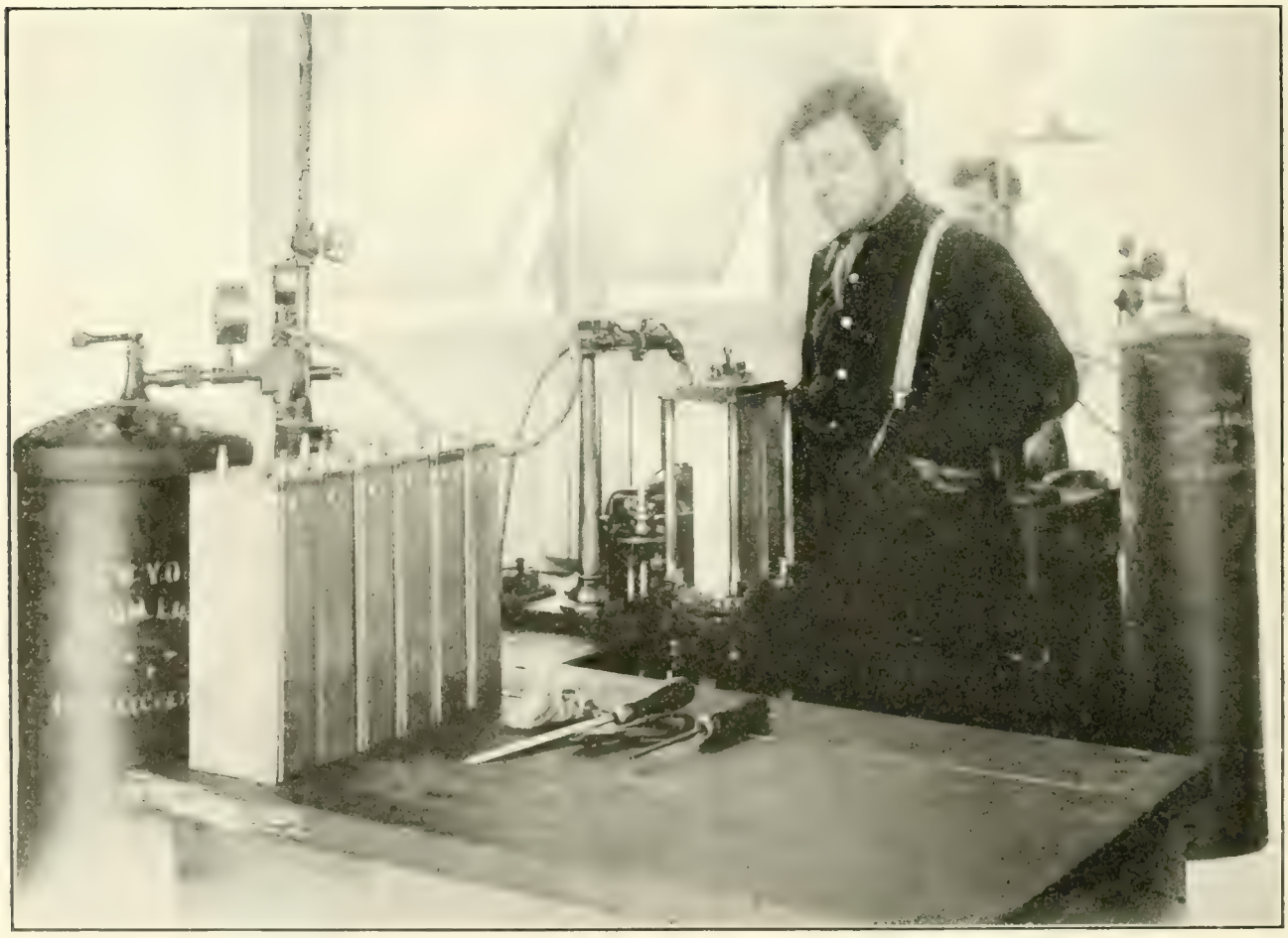

Fig. 6. Welding the Seams in the Steel Cans, Used for the Storage Battery Container, by Means of the Oxy-Acetylene Blowpipe.

manner indicated in Fig. 6 and the whole can is thus made seamless, enabling it to withstand the shocks and jars to which it may be subjected, and absolutely to prevent any leakage.

When this can is completed, it is given an extremely heavy electrodeposit of pure nickel and then placed in a muffle furnace in which a current of hydrogen gas is passed. The muffle is heated to redness and the hydrogen gas is allowed to pass in for some time. It is a well known fact that electrodeposited nickel contains occluded hydrogen gas which renders it brittle and liable to peel. By heating such an electrodeposit the gas is expelled and the nickel is rendered soft and pliable so that it will not peel from the surface upon which it has been plated. Owing to the oxidation that would take place were the nickel heated in the air, it is necessary to heat it in some inert or reducing gas and hydrogen gas has been found to be suitable for the purpose. The cans, therefore, have a heavy coating of nickel that will not peel or flake while in service. In fact, they serve all the purposes of a solid nickel can and are much cheaper.

The grids comprising the positive and negative plates of the cell are also made of sheet steel, formed into the necessary shape and then electroplated with a heavy coating of nickel. When the desired thickness has been obtained, the grids are heated to redness in an atmosphere of hydrogen in the same manner as the cans so that for all purposes, one equal to a solid nickel grid is obtained. In Fig. 7 the nickel plating room at the Edison Storage Battery Company's plant is shown. In this room the nickel plating of the cans and grids is carried on. Various labor saving devices are used for plating the work so that the operation is done in a very uniform manner without the factor of uncertainty that so frequently enters ordinary plating operations.

Fig. 7. The Nickel Plating Room at the Edison Plant, in Which the Containers and Battery Grids are Nickel Plated.

The Edison battery, as previously described, consists of a steel can for the container. This feature avoids the frequent breakage that often follows the use of glass or hard rubber.

Not only is the steel cheaper, but lighter so that much has been gained by employing it. The electrolyte employed in the battery is a 21% solution of caustic potash which not only has no action on the can but really prevents it. It is now a well established fact that alkalies prevent the rusting of iron.

The discharge voltage of each Edison cell is about 1.2 volts which is lower than that of the lead cell, but this is no objection for the reason that it is offset by the increased capacity and the fact that the cell is not injured by overcharging or allowing to stand discharged. The so called "white-plague" or sulphating that occurs in the lead cells is always a serious obstacle in their use, but in the Edison cell it never takes place. The very large number of commercial and pleasure vehicles that are now operated by them fully testifies to their value. From the start, Edison has had one end in view, and that is the use of the battery in self-propelled vehicles and it is upon this one application that he has for years concentrated his energies. The success that has followed the use of the battery in this direction has had a counter success in other lines although not as yet fully developed or the value realized. As soon as the value of the battery is fully appreciated or known, a very extensive use outside of the transportation line is predicted.

A New Process of Holding Lead in a Copper and Lead Bearing Bronze.

When copper and lead are alloyed in the ordinary manner and poured into a sand mold, the lead settles to the bottom of the mold during the cooling. There are several methods now in use for preventing it, and a new process has recently been patented by Louis C. Dodd of Buffalo, N. Y. (U.S. Patent 971,669, Oct. 4, 1910). In connection with the method of preventing the separation of the lead, the inventor makes the following comments upon the value of the copper and lead alloys as bearing metals:

"It is well known to all versed in the art of making or compounding bearing metals, that a copper-lead alloy is the best alloy for bearing purposes. Especially so for bearings subjected to heavy loads, and especially where it is required that the bearing should conform itself, in a limited degree, to both the journal and its seat, that is, have malleability or plasticity. It is also known that a high percentage of lead in an alloy renders it to a greater degree proof against the destructive action of acids, alkalies and chemicals. The difficulty in alloying copper and lead is due to their great difference of melting temperature, their slight affinity for each other and their difference in specific gravity. The copper in the molten mixture of lead and copper tends to solidify while the lead remains molten and owing to its higher specific gravity tends to settle to the bottom. It is also known that the lead and copper are only a mechanical mixture and that at best the lead is suspended in a matrix of copper: now, the object of my invention is to accomplish this suspension more perfectly than has ever been done before, that is, hold a larger percentage of lead in suspension in a more finely divided state in a less expensive manner than heretofore."

The method used for holding the lead in the copper and lead alloy is to use a small amount of iron in it. The iron in the alloy solidifies first and holds the lead in suspension. In addition to the iron, a small amount of manganese is introduced as it acts as a carrier of the iron. Without it, the iron alloys with difficulty. Zinc may also be used, the inventor says, for the purpose of deoxidizing, although it is not essential.

The amount of lead used varies from 30 to 50 per cent. Above 50 per cent. the mixture becomes too soft. The manner of making the copper and lead alloy containing the iron and manganese is as follows:

A "tempering alloy" is first made by melting together equal parts of Norway iron and 80 per-cent ferro-manganese. This gives a mixture composed of 60 per-cent of iron and 40 per-cent of manganese. This "tempering alloy" is then added to copper, to make the desired mixture for the casting. The final bearing alloy, when completed, will have the following proportions:

Copper	57%
Lead	30%
Zinc	8%
Iron	3%
Manganese	2%

The zinc may be omitted, but it serves to cheapen the mixture. In case a softer mixture is desired, more lead and less copper may be used.

The New Haven Sand-Blast Tumbling Barrel.

Since the sand-blast was first invented, the treatment of small or medium size articles has been an unsolved problem. In order to treat them by sand-blasting, it is necessary, when the usual form of sand-blast is employed, practically to handle each piece separately. Unless this is done, every portion of the surface will not be acted upon by the sand. It will readily be appreciated, therefore, that in the case of cheap cast-iron goods, which could be admirably treated by sand-blasting, that will at once appeal to the manufacturer of small metal goods. The barrel has been designed and patented by Mr. C. A. Dreisbach of this company who early realized the value of such a barrel.

The barrel is shown in Fig. 1 and is made good size in order to treat a large quantity of work at one time. The advantage of being able to clean a wheelbarrow load of castings at a time will be appreciated by any manufacturer. The outer shell of the barrel is

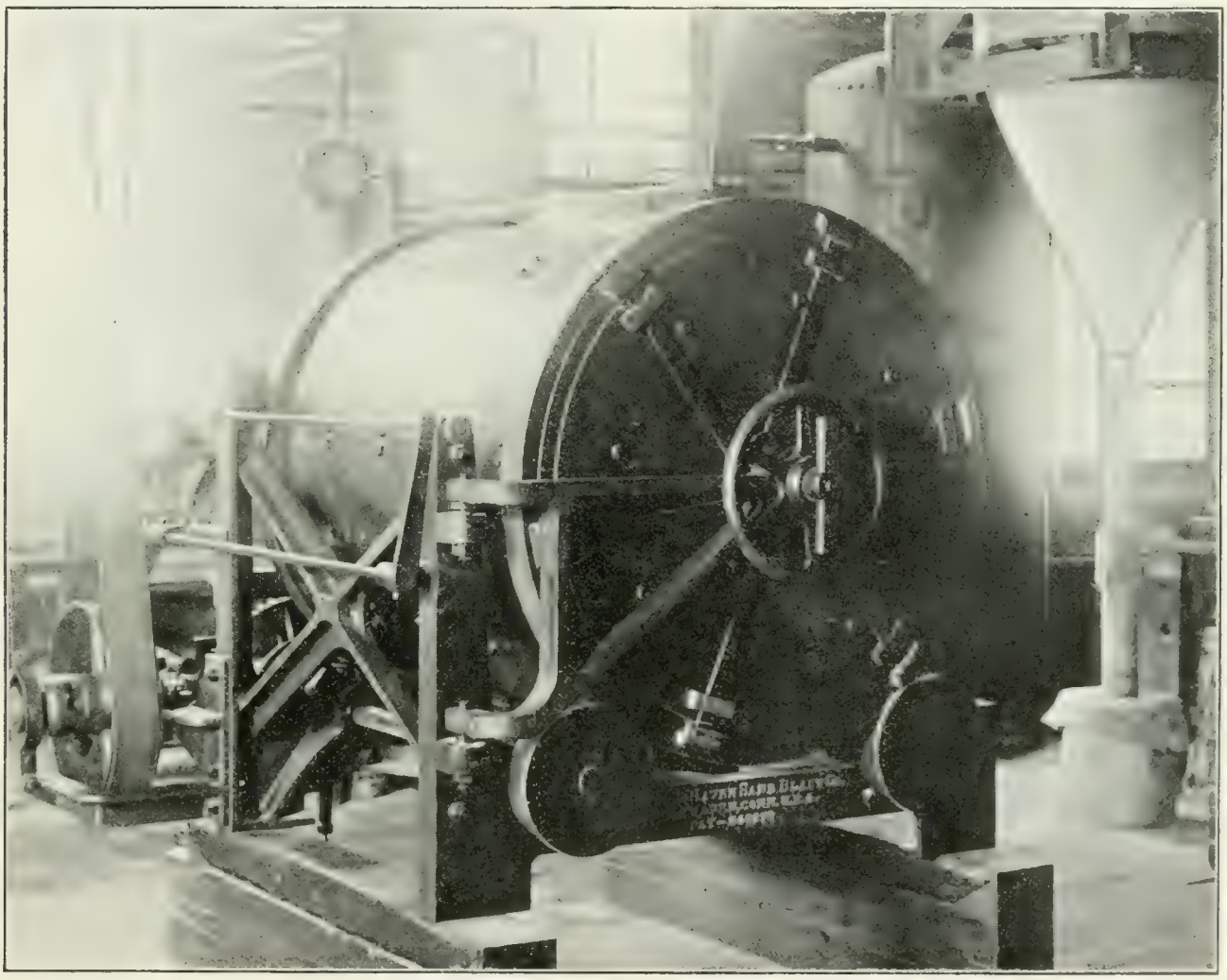

Fig. 1. The New Haven Sand Blast Tumbling Barrel, Showing Method of Fastening Door.

the expense of handling each piece is so great that the cost becomes excessive and prohibits the use of the blast. This fact has been a deplorable one for the reason that for many purposes, such as galvanizing or tinning, a sand-blasted surface is particularly desirable. Resort has been made, therefore, to pickling with all its disadvantages

The sand-blast tumbling barrel recently placed on the market by the New Haven Sand Blast Co., has been constructed in a manner made of cast iron and is fitted with a door at the front allowing the full diameter of the barrel to be exposed for charging. This door is clamped tight by means of a hand wheel in the center which thus prevents the escape of any dust. The barrel rests upon roller bearings so as to permit of easy rotation, and devices attached allow of any necessary adjustment being made to compensate for wear.

The interior of the barrel is shown in Fig.

2. In this illustration a wheel-barrow load of cast-iron food choppers is shown inside and which, although of intricate shape, are readily cleaned by it. The barrel is fitted with a sheet steel lining that is perforated. Between this lining and the outer shell a series of buckets are placed. To begin the operation a couple of shovelfuls of sand are placed on the work to be blasted. The door is closed, the barrel started revolving and then the blast turned on. The buckets elevate the sand and drop it into the hopper at the top of the barrel as shown in Fig. 2. It then drops down and falls into the blast when it issues from the nozzles (the foremost one of which is shown in Fig. 2) and forms the sand-blast. Four nozzles are provided so that a large area of surface is blasted. The number and size of the nozzles may be varied, however, to suit special work. The nozzles themselves are made of hard iron and may be replaced as they wear in a moment's time.

The blast used is about 50 lbs. per sq. in. as it has been found that the cleaning takes place more rapidly than when a lower pressure is employed. The sand is used over and over in the barrel and when the required amount is placed in it and the operation begins, no more need be introduced. The buckets continuously elevate it and feed it to the air blast.

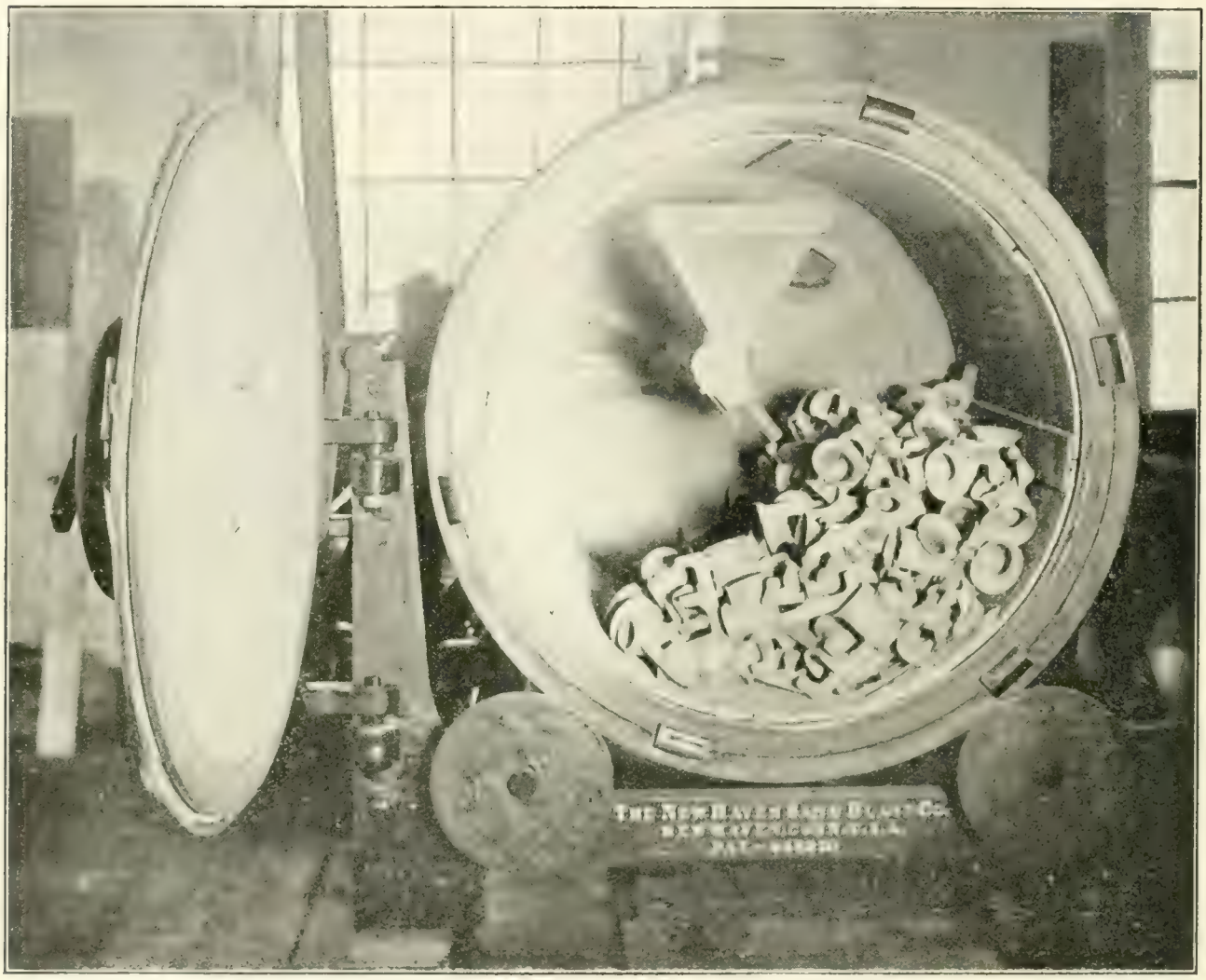

Fig. 2. Interior of the Sand Blast Tumbling Barrel Showing a Wheelbarrow Load of Cast-Iron Food Choppers That Were Cleaned in 20 Minutes.

An ingenious exhaust system is supplied with the barrel so that no dust escapes, and a portion of the sand that is still of value is retained for use again.

The value of the barrel lies in the fact that as the work to be cleaned is tumbled, the blast plays upon every portion of it. In the case of the food-choppers shown in Fig. 2 as the charge, the cleaning took 20 minutes and when finished every portion of the surface was cleaned, both inside and outside. The barrel is revolved quite slowly as all that is necessary is to bring every portion of the surface of the work being blasted under the blast itself. The amount of time consumed in the blasting varies with the work. Small

work, such as the majority of hardware, and which is more or less plain, can be finished in 5 minutes. The food-choppers, being so intricate, require a slightly longer time.

Treating Brass Castings.

Brass castings are cleaned in the barrel as

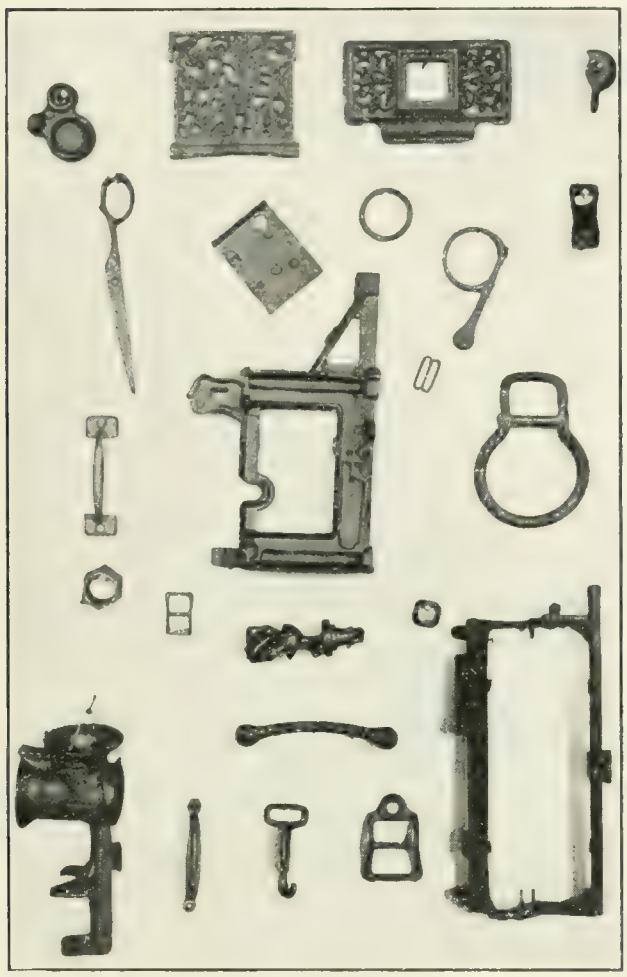

Fig. 3. Variety of Articles Cleaned in the Tumbling Barrel.

readily as iron or steel goods. In a recent test made by the inventor, a quantity of plumbers' brass goods, such as faucets, cocks and valves were charged into the barrel. These were just as they came from the foundry *and the cores had not been removed.* More difficult and intricate castings for cleaning would be difficult to find. A charge of 425 lbs. was cleaned in 20 minutes, the cores were removed and the surface was found clean both inside and outside.

Copper or its alloys is acted upon by rubber and should not be used on rubber goods.

If a bright dip does not work smoothly, the addition of a little water will frequently overcome the trouble. Acids that are too strong usually do not work well in dips.

A New Zinc Anti-Friction Alloy.

A new alloy for use as an anti-friction metal has been patented by Joseph R. Stratton of Moncton, New Brunswick. He claims that a zinc base alloy has several advantages in it and particularly as the melting point is sufficiently high to prevent the running out when a bearing containing it heats. He recommends the following proportions:

Zinc	25 lbs.
Lead	3 lbs.
Tin	1¾ lbs.
Copper	½ lb.
Antimony	3 oz.

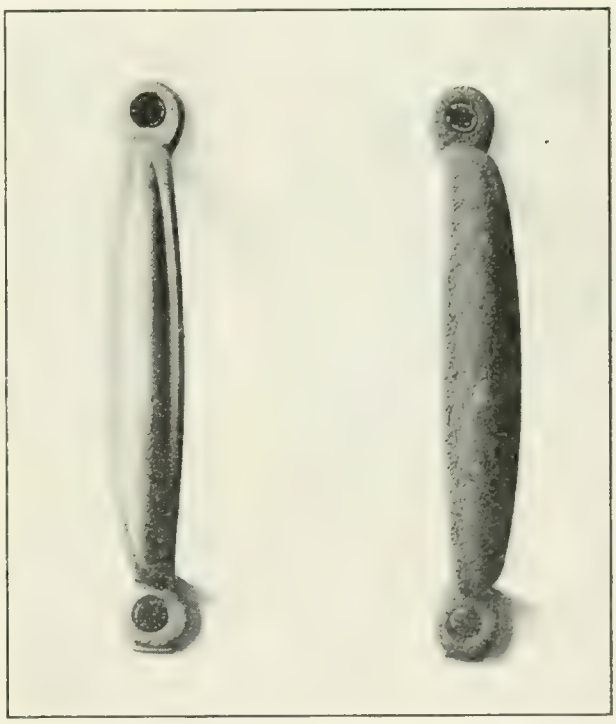

Fig. 4 Cast Handle Before and After Cleaning in the Tumbling Barrel.

When calculated in percentages, the mixture works out as follows:

Zinc	82.0%
Lead	0.8%
Tin	5.8%
Copper	1.7%
Antimony	0.7%

The alloy is recommended by the author for railroad and similar heavy work.

A smooth surface on tinned iron or steel goods can only be obtained by the use of two tinning kettles. The first is used to coat the articles, and the second, with a layer of tallow on its surface, is used to smooth and even up the tin on the surface.

Solubility of Oxygen Gas in Molten Silver and Its Effect in Producing Blisters.

In a paper read before the *Society of Chemical Industry* at the Liverpool, England meeting held in January and published in the journal of the Society on Aug. 31st., F. G. Donnan and W. A. Shaw give the results of their experiments on the effect of oxygen gas on molten silver.

They say in 1820 Chevillot found that 8 grams of silver, saturated with air during melting, gave up 7.8 c. c. of oxygen gas during solidification. Gay Lussac, in 1830, found that 1 volume of silver evolves 22 volumes of oxygen in passing from the liquid to the solid state. Quoting their own words, they make the following comment: "A careful determination with modern methods of the solubility of oxygen in molten silver possesses both a technical and scientific interest. For the silver smelter and refiner is troubled with "spitting" of the silver in the molds during a pour, and with the liability of the ingot to blister on rolling, due to the still entangled oxygen; while the molecular condition of the oxygen dissolved in the molten metal presents an interesting scientific problem. A knowledge of the amount of oxygen dissolved in a given mass of molten silver at a given temperature might prove useful to the refiner, in giving him some guide to the amount of oxidizable metal (aluminum, copper) required to be added to the melt in order to deoxidize it."

In the opinion of the authors, the working of the silver in an atmosphere of some gas that is not soluble in molten silver offers too many obstacles for commercial usage.

An elaborate series of experiments were carried out and the conclusions reached were as follows:

It was concluded that the oxygen gas is dissolved as atomic oxygen (by simple solution) or as silver monoxide. If it is in existence as silver monoxide, then this compound dissociates at about 1000° C. into silver and oxygen which escapes causing the "spitting." In case it is the simple solution of the oxygen gas, then this is given up at the aforesaid temperature with the same result.

They found, as the results of their experiments, that at the melting point of silver, 11 c. c. of oxygen gas can be dissolved or absorbed by 10 grams of silver. The authors then comment upon the amount of deoxidizing agent that is necessary for the removal of this oxygen. They suggest the use of aluminum* as the deoxidizing material. Calculating upon the preceding basis, they state that 10 grams of aluminum will deoxidize 1000 grams of silver, or in other words, 1% of aluminum is required.

They also suggest the use of steam to blow out the dissolved oxygen and also, in case aluminum has been used, to remove the excess remaining in the silver after deoxidizing.

After the paper had been read at the meeting, a discussion followed and some of the remarks are of interest.

H. J. Watson said that in the refining of silver, it absorbed oxygen very quickly, and there was considerable difficulty in ladling the silver in consequence. He had tried copper and found it to answer very well. The copper absorbed the oxygen which the silver had dissolved; but when they commenced to ladle the silver, while the surface was fairly free from slag, the first few bars did not spit on cooling, but the later ones did showing that oxygen was absorbed very rapidly. Unless the ladling was carried out very quickly the later bars had in some cases to be removed to the furnace. He might add that their difficulties arose through having to remove tellurium. It was then that the silver began absorbing oxygen. Before that they had no trouble. They blew the silver with steam .

Prof. F. G. Donnan (one of the authors of the paper) in reply to questions, said that no experiments had been made on the use of aluminum as a deoxidizing agent. In reply to Mr. Watson's comment he stated that it would be of interest to know whether better results could be obtained by keeping a current of dry steam continuously passing through the silver while molten. He would point out to Mr. Hill, who had inquired whether the steam would not have an oxidizing action, that at the temperature in question the dissociation of steam was far too small for that to occur.

H. J. Watson, in replying, said that he used steam to oxidize the impurities in the silver.

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*The use of aluminum as a deoxidizing agent for silver has never been found satisfactory in silver smelting, and as far as known is not used—*Editor.*

Steam *did* oxidize them, but not the silver. They did not blow the steam through the silver during the ladling operation, but upon the surface while this was being done.

Flux for Coating Iron or Steel with Brass by Dipping.

A flux for use in coating iron or steel with brass by dipping it into the molten metal, has been patented by Walter S. Rockey and Hilliary Eldridge, of New York City (U. S. Patents 971,563 and 971,564, Oct. 4, 1910). This flux is used by them in their process for brass plating iron or steel by dipping it into a pot of molten brass covered with it. The flux causes a firm union between the iron or steel and the brass, and when cool the coating of flux on the surface flakes off leaving a bright brass coating on the metal. The process was described in THE BRASS WORLD, Nov. 1909, page 403 and Jan. 1910, page 25. At that time a different flux was used. The following is now employed:

Boracic acid is heated in a silver plated iron crucible until all the water is driven off. It is stated that iron will not answer as the boracic acid attacks it and interferes with the final use in coating iron or steel with brass. When the water has been driven off, the boracic acid is transferred to a clay crucible and heated to a white heat. The heat is now lowered to a red heat, and enough powdered silica is then added to render the mass dense. A small amount of metallic zinc is now added to "decompose the constitutional water," as the inventors say. After the zinc has been added, the crucible is heated until the green flame subsides.

The flux is now poured out and is ready for use. In brass plating iron or steel with it, the brass is melted under a good layer of the flux, the iron or steel, previously cleaned, is dipped into it and then at once withdrawn and plunged into water. The flux scales off leaving the metal brass plated.

In the manufacture of the best grades of galvanized iron wire and sheet, it is necessary to use a highly refined spelter for coating it in order to stand the bending that is put upon it when manufactured into various articles. A low grade spelter, if used for the coating, will flake off when bent.

Recent Government Specifications for Brasses, Bronzes and Other Non-Ferrous Metals.

Recent U. S .Government specifications issued by the Bureau of Steam Engineering on July 1st. 1910, for the inspection of material purchased will be of interest.

Specifications for Casting Materials

The composition must be made of such materials as will give the required chemical analysis. Scrap will not be used except such as may result from the process of manufacture of articles of similar composition.

Commercial Brass

Copper	64-68%	
Zinc	32-34%	
Iron	2.0%	(maximum)
Lead	3.0%	(maximum)

*Muntz Metal**

Copper	59-62%	
Zinc	39-41%	
Lead	0.6%	(maximum)

Brazing Metal

Copper	84-86%	
Zinc	14-16%	
Iron	0.06%	(maximum)
Lead	0.30%	(maximum)

Gun-Bronze

Copper	87-89%	
Tin	9-11%	
Zinc	1-3%	
Iron	0.06%	(maximum)
Lead	0.20%	(maximum)

Journal-Bronze

Copper	82-84%	
Tin	12½-14½%	
Zinc	2½-4½%	
Iron	0.06%	(maximum)
Lead	1.00%	(maximum)

Valve-Bronze

Copper	87%	
Tin	7%	
Zinc	6%	
Iron	0.06%	(maximum)
Lead	1.00%	(maximum)

Ingot-Copper

Copper ..... 99.80% (minimum) and free from sulphur and other impurities.

*No mention is made of the iron content.

*Manganese-Bronze**

Copper	57-60%	
Zinc	37-40%	
Tin	0.75%	
Iron	1.00%	(maximum)
Aluminum	0.50%	(maximum)
Manganese	0.30%	(maximum)

Monel-Metal Castings

Nickel	60%	(minimum)
Copper	33%	
Iron	6½%	
Aluminum	½%	
Lead	none	

Cast Naval-Brass

Copper	59-63%	
Zinc	35½-40½%	
Tin	½-1½%	
Iron	0.06%	(maximum)
Lead	0.60%	(maximum)

Phosphor-Bronze

Copper	80-90%	
Tin	6-8 %	
Zinc	2-14%	
Phosphorus	0.30%	
Iron	0.06%	(maximum)
Lead	0.20%	(maximum)

Screw Pipe Fittings of Brass

Copper	77-80%	
Zinc	13-19%	
Tin	4%	
Iron	0.10%	(maximum)
Lead	3.00%	(maximum)

Metallic Nickel

Nickel	97%	(minimum)

Tin

Tin	99.6%	(minimum)

Lead

No. 1 Lead	99½%	(minimum)
No. 2 Lead	97½%	(minimum)

*Thrust-Rings**

Copper	82-84%	
Tin	12½-14½%	
Lead	2½-4½%	

Monel Metal Ingots

Nickel	60%	(minimum)
Copper	38%	
Manganese	2%	

*No mention is made of the lead content.

*No mention is made of zinc or iron.

with small amounts of other ingredients not injurious to casting qualities, or detrimental to strength or non-corrosive properties.

Specifications for Rolled Material.

Admiralty Metal

Copper	70%	(minimum)
Zinc	29%	
Tin	1%	(minimum)
Lead	0.075%	(maximum)
Iron	0.06%	(maximum)

Benedict-Nickel

Copper	84-86%	
Nickel	14-16%	

*Sheet Brass and Tubing**

Copper	60-70%	
Zinc	30-40%	
Lead	0.50%	(maximum)

*Brass Rods**

Copper	60-63%	
Zinc	37-40%	
Lead	3%	(maximum)

Copper

Copper	99.5%	(minimum)

*Muntz-Metal**

Copper	59-62%	
Zinc	38-41%	
Lead	0.60%	(maximum)

Phosphor-Bronze

Copper	85-95%	
Tin	5-10%	
Zinc	4%	(maximum)
Lead	0.20%	(maximum)
Iron	0.06%	(maximum)
Phosphorus	0.15%	

Manganese-Bronze

Copper	57-60%	
Zinc	37-40%	
Tin	0.50%	(maximum)
Iron	1.00%	(maximum)
Manganese	0.30%	(maximum)

Monel-Metal

Nickel	60%	
Copper	36%	
Iron	3½%	
Aluminum	½%	
Lead	none	

*No mention is made of iron.

Rolled Naval Brass

Copper	59-63%
Zinc	35½-40½%
Tin	½-1½%
Lead	0.20% (maximum)
Iron	0.06% (maximum)

"The proportions given in all the preceding mixtures are approximate and are as a guide as to about the proportions of the elements that are expected, except for lead, aluminum, and iron which are maximum limits."

The following are the physical requirements of the preceding rolled alloys and metals:

	Tensile Strength Sq. in. (minimum)	Yield Point	Elongation in 2 in.
Copper	30,000 lbs.		25%
Muntz Metal	40,000 lbs.	20,000 lbs.	25%
Phosphor-Bronze	50,000 lbs.	25,000 lbs.	25%
Naval Brass (1 inch and below)	62,000 lbs.	31,000 lbs.	25%
Naval Brass (over 1 inch)	60,000 lbs.	30,000 lbs.	28%
Manganese-Bronze (1 inch and below)	72,000 lbs.	36,000 lbs.	28%
Manganese-Bronze (over 1 inch)	70,000 lbs.	35,000 lbs.	30%
Monel-Metal (1 inch and below)	84,000 lbs.	47,000 lbs.	25%
Monel-Metal	80,000 lbs.	45,000 lbs.	28%

The following physical requirements will be met by castings *not* for ornamental purposes:

Minimum	Tensile Strength per. sq. in.	Yield Point	Elongation in 2 in.
Gun-Bronze	30,000 lbs.	15,000 lbs.	15%
Manganese-Bronze	60,000 lbs.	30,000 lbs.	20%
Monel-Metal	65,000 lbs.	32,500 lbs.	25%
Phosphor-Bronze	40,000 lbs.	20,000 lbs.	20%

Method of Casting Test Pieces

In the case of screw propellers of manganese-bronze, coupons will be cast attached to the hub and to each blade. The coupons will be cast flat on the blade or hub. Those on the blades will be attached at half the distance from the root of the periphery. The coupons will be cast of such size as may be found necessary to give a sound test specimen. The coupons are to have no treatment other than machining to reduce them to the proper diameter. For castings weighing over 200 lbs. test pieces or coupons shall be taken in such manner and from such parts of the casting as will thoroughly exhibit the quality of metal, not less than three being taken for large propeller blades.

For Monel-metal propellers, test coupons will be attached to the hub and will be three in number. Two will be tested and one retained for test in case of defective specimens.

Castings of gun-metal, manganese-bronze, Monel-metal or phosphor-bronze, weighing less than 200 lbs. finished, may be tested by lots or heat, a lot not to exceed 200 lbs. and heat not to exceed 500 lbs. of finished castings. Each lot or heat will be represented by one test specimen when atached to a casting or when a casting is sacrificed to obtain a test specimen. If the castings are too small for the attachment of coupons, the test pieces may be cast separately from the same metal. Where test pieces are cast separately from the castings, two test pieces will be required, one to be poured before and one after the castings. Coupons shall not be detached from the castings until they are stamped by the inspector.

The color of the fracture of the test pieces and the grain of the metal must be uniform throughout.

General Notes

Spring brass shall not be ordered in widths exceeding 12 inches.

In general, the terms used in giving the temper will be soft, medium hard, hard and extra hard. Other trade names to designate the temper are dead soft, half hard and three quarters hard. Spring wire will be elastic and no harder than will meet the temper required.

All brass tubing, unless ordered "hard" is to be annealed sufficiently to prevent "fire-cracking" and to stand physical tests.

The end of each test piece of brass tubing must stand being flattened by hammering until the sides are brought parallel with a curve on the inside at the ends not greater in diameter than twice the thickness of the metal in the pipe without showing cracks or flaws.

Each tube shall have a piece 3 inches long cut from it which piece, when split, must stand opening out flat without showing cracks or flaws.

Brass tubing for radiators for heating system to be semi-annealed, and to stand bending 180° around a diameter of 1½ times the outside diameter of the pipe, without cracking.

Benedict-nickel, Monel-metal and similar kinds of material must stand the hot or "fire-crack" test by having pieces, 2 feet long, heated to about 300° F. plunged into ice cold water. No cracks must show.

Brass condenser tubes for distiller use must be tinned.

If 10% of the tubes of any lot show slivers inside, the lot will be rejected.

The tubes must stand hammering flat. They must also stand the driving of a taper plug in the end, so that the internal diameter is increased 16-2-3 per-cent, with splitting.

All tubes to stand a hydrostatic pressure of 1000 lbs. per sq. in. and a pneumatic pressure of 80 lbs. per sq. in., in the tubes being immersed in water during the latter test.

All tinned tubes must be acid cleaned, dipped in molten tin and then immediately wiped with hempen tow inside and outside to insure their being smooth.

All Admiralty Mixture tubes shall be annealed and acid cleaned before tinning. Benedict nickel tubes shall not be annealed.

Specifications for Babbitt-Metals

The composition (babbitt-metal) shall consist of the following:

Banca Tin	88.8%
Antimony	7.5%
Copper	3.7%

The metals shall be well fluxed with rosin and borax in mixing. In case Banca tin cannot be obtained, other brands may be substituted upon application to the Bureau of Steam Engineering.

A Select Method for Satin-Finishing Aluminum, with Note on the Use of the Sand Blast.

By "Connecticut."

Noting the article on satin-finishing aluminum by means of a dip in the October number of THE BRASS WORLD, it may be of interest to your readers to know of the method that I have been using for some time with the production of the finest results. I believe it will be found much superior to the aforesaid process. The manner in which I carry it out is as follows:

Buff the aluminum article, if necessary, in order to obtain a good surface and then clean off the grease in benzine. Now dip into a scalding hot potash solution, not too strong, until the surface is dull and white. Rinse in cold water and soak for 5 or 6 minutes in a 5 per cent. solution of hydrofluoric acid to soften the surface. Now rinse well in cold water and dip into a mixture of equal parts of nitric and sulphuric acid. This will remove the discoloration. Now rinse in cold water and then in the *cleanest* hot water. Dirty hot water will leave stains on the surface. Now dry in sawdust of good quality and which is free from pitch or gum. Boxwood or birch should be used if possible. The bare hands, no matter how clean, should never touch the aluminum at this stage or stains will result.

The frosting is now done with a fine, soft, steel-wire scratch brush, 6 inches in diameter and running 2500 revolutions per minute. New brushes should be broken in on coarse work, or by running them against a file for some time.

In regard to the use of the sand-blast for satin finishing aluminum, as far as my experience goes, I do not consider it a satisfactory way, for the metal is so soft that it cuts up like lead or pewter.

An Ancient Lead Mirror.

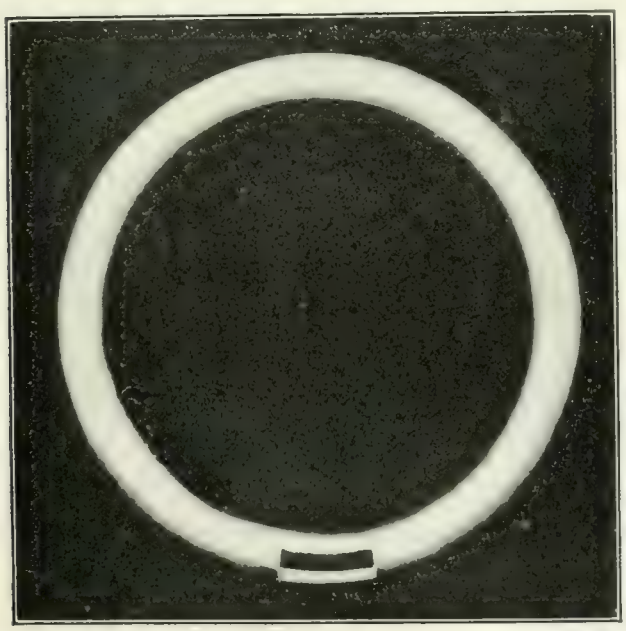
A glass mirror was recently found in the ancient Roman burial ground in Laibach and which it is believed dates back to the second or third century A. D. The mirror consists of a convex glass fitted into a glass rim. On the back, in place of the customary silver now employed, a sheet of lead foil had apparently been fastened by means of a balsam of some kind. In the long time that has elapsed the lead has become converted into a resinate, but a microscopical and chemical examination showed that it was undoubtedly lead foil.

Correspondence.

Production of a Heavy Brass Deposit.

Editor:

A number of times recently, I have seen in the different publications devoted to electrometallugy, that it is impossible to deposit a durable or heavy coating of brass on iron or steel articles adapted for use on automobiles. Thinking it an interesting proposition I have made a few experiments and am sending you the results (herewith shown) thinking it might be of interest to your readers.



Iron Ring with the Heavy Brass Deposit, Cut Away to Show the Thickness.

I think I have demonstrated that such a deposit is not impossible, but I am not at the present time prepared to say it is either practical or economical. I send the articles merely as a curiosity. I will not say, however, that the proposition is impossible with the proper knowledge of the electrodeposition of metals and with the necessary apparatus.

The ring herewith shown is composed of iron and the brass has been plated upon it. It was in the brass solution for 18 days and was not removed during that length of time until the operation was completed. The plating was carried on 10 hours each day. The rings were plated in a plating barrel. The results seem to show that the production of a heavy brass deposit is possible.

(The ring has been cut away as illustrated in the photograph in order to show the relative thicknesses of the iron and the brass. The iron in this ring is 1-8 inch in thickness, while the brass that was deposited was 3-16 inch in thickness.—*Editor.*)

New Britain, Conn. *J. W. FORCE.*

Hardness of Silver and Copper Alloys.

In *Zeitscrift anorg. Chemie,* 68,1910, pages 123-140 three investigators give the results of their experiments on the properties of the alloys of silver and copper and among them the hardness as found by the Brinell method The results obtained were as follows:

Silver	Copper	Hardness
100%	0%	24.8
95%	5%	46.0
94%	6%	49.6
90%	10%	50.0
80%	20%	51.0
0%	100%	40.0

These figures are interesting as they show that copper is much harder than silver. They also indicate that increasing the amount of copper in a silver and copper alloy does not appreciably increase the hardness. It would seem, therefore, that the belief is erroneous that the increase or decrease in the amount of copper in sterling silver has influence upon its hardness. It has been supposed that unless the full 75 parts of copper per thousand are present in sterling silver it is too soft for flat-ware and particularly forks, but these results show that a sterling silver of 930 fineness will undoubtedly give equally as good service as one of the full 925 fineness.

Improved Method of Facing Molds for Making Fine Brass Castings.

An improvement in the method of facing sand molds used in making a fine quality of brass castings has recently been patented* by George Hale Brabrook of Taunton, Mass., formerly general manager of the Reed & Barton Co., of that city. In connection with the method he makes the following comments upon the ordinary method of making fine brass castings:

"In the production of high grade castings by the well known sand molding process, the pattern, after being properly bedded in the sand, is withdrawn and the mold is "faced." This is accomplished by sprinkling or spraying the sand mold lightly with water and then shaking upon it, through a cloth bag, the facing material, which may be French burnt molding sand, or other well known material commonly employed for this purpose. The pattern is then replaced in the mold and the mold rammed. When a fine sharp casting is required, this facing process is repeated, since a single facing of the mold will result in a relatively rough casting. Since ,however, the facing material is applied dry only a little of it will adhere to the mold at a time, and if this facing process is repeated a number of times there is increasing danger ot injuring or impairing the mold, since the high portions of the ornamentation of the mold become comparatively dry and tend to break away or stick in the deep hollows of the pattern.

It will be noted that the proper facing of the mold is a highly important part of the work of producing a casting, and that as the quality, fineness and high grade of the casting increases the time and skill required in performing, the facing operation increases in greater ratio. It not infrequently happens in my experience that in properly preparing the mold, from which a flower or fruit design of average character is to be made, one-half to two-thirds of the whole time required is devoted to the proper facing of the mold and this is true of the most skilled of the workmen employed."

The method which is used for making the fine castings is best described in the words of the inventor:

"In practicing my improved method or process of facing the mold I proceed as follows: After the pattern has been withdrawn, the mold is preferably lightly sprayed with water to slightly moisten the surface. This may be unnecessary if the sand is sufficiently moist. I then apply a mixture of any well known facing material, German or French burnt sand, for example, and some volatile liquid, such as benzine. The said facing material and liquid are preferably mixed in the proportions of one-third of a pint of facing material to one pint of volatile liquid. The facing material is held in suspension in the liquid and the proportions may be varied so long as the resulting mixture is such that it can be sprayed or otherwise uniformly applied to the mold to effect the deposit upon the surface of a substantially uniform layer of the facing material. The facing material thus applied forms a pasty or plastic layer or skin on the surfaces of the mold.

After the above mixture has been thus applied, and before the volatile liquid has had an opportunity to evaporate entirely, the pattern is replaced in the mold and the mold rammed. The pattern is then removed and the surface of the mold will be found to present a very detailed clear sharply-defined copy of the pattern. The mold may then be sprayed with oil to hold the facing in place if the mold is to be baked in the usual way. Of course other volatile liquids may be employed instead of benzine, I prefer benzine chiefly because of its cheapness. The benzine may be modified to cause it to evaporate more slowly, should that be desired, or it may be rendered non-inflammable by the admixture of a proper proportion of tetrachlorid of carbon. As will be obvious the volatile liquid used must be such as will not attack the surfaces of the patterns employed.

A great advantage resulting from the employment of my process and which I have not heretofore referred to, is to be found in the saving of facing material. My experience has been that a very large percentage of this material is lost when it is shaken onto the molds while by my process hereinabove described the loss is reduced to a minimum and where ordinary care is used is practically nothing."

The process is not only applicable to the making of fine brass castings in sand molds, but also to the production of those of bronze, sterling-silver or German-silver."

*United States Patent, No. 972,325, Oct. 11, 1910.

Some "Don'ts" in the Use of Lacquer.

A lacquer salesman, who has apparently found many odd conditions in his travels, sends us the following list of "Don'ts" as applied to the use of lacquer. As they are right to the point they may serve to soothe the troubles of other salesmen and lacquer users as well:

Don't put your lacquer in a galvanized iron tank.

Don't give your work 200° F. in drying if 150° F. is all it requires.

Don't give your work 110° F. if 200° is what it needs.

Don't use a dip lacquer as a brush lacquer and expect to obtain the same results.

Don't use a cheap lacquer on high grade work.

Don't use any but the regular thinner made for the lacquer used.

Don't neglect to remove immediately from your lacquer any pieces of metal that have accidentally dropped in.

Don't forget to clean your lacquer tank as often as convenient.

Don't dip your work if you can obtain better results by spraying.

Don't hold your spray too far away from your work.

Don't thin your lacquer too much or leave it too thick when a thin lacquer is required.

Don't apply your lacquer until you are confident that your work is absolutely clean.

Don't forget that using a special lacquer for a special finish gives the best and cheapest results.

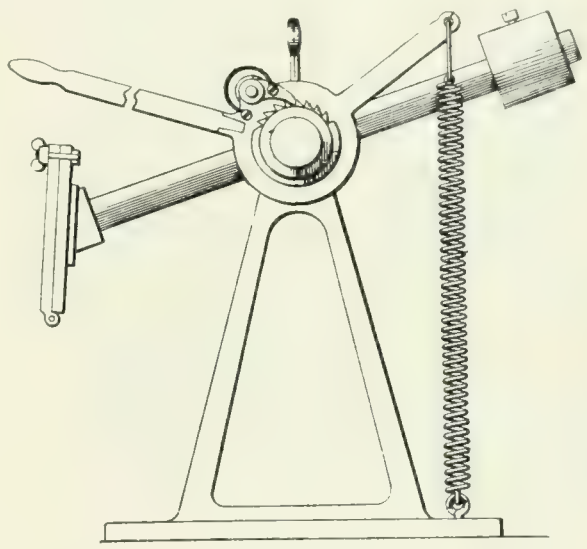
Don't fail to realize that it is the lacquer that protects your finishes.

Coffin hardware is first nickel plated and then given a very light silver deposit. Were the light silver deposit put directly on the soft metal (lead and antimony) it would be absorbed in a comparatively short time. Soft metals have the property of absorbing light deposits of silver and copper.

A rough surface on sterling-silver goods after they have come from the "firing-dip" is caused by an insufficient pickling in the sulphuric acid pickle after annealing. Unless all the black oxide is removed in the pickle, the surface of the silver will be rough after coming from the nitric acid "firing-dip."

A Spring-Actuated Centrifugal Casting Machine.

A spring-actuated centrifugal casting machine has been devised and patented by James M. Allen of St. Louis, Mo., (U. S. Patent 971,957, Oct. 4, 1910.) An arm pivoted on trunnions at the center has the mold fastened on one end and a weight for counterbalancing at the other. By means of a ratchet and pawl device, the arm is caused to rotate until the spiral spring, shown in the illustration, exerts a strong tension on it and is held firm and fast.



New Type of Centrifugal Casting Machine.

The metal is now poured into the mold (shown at the left end of the arm) and the pawl is then at once released by the lever. The arm, carrying the mold, then revolves at a high velocity for a short time until the metal solidifies. It is claimed that gases are expelled from the metal and a sound casting is obtained. The fact that the mold can be revolved at the immediate cessation of the pouring is the particular advantage claimed for the appliance.

The black coating that forms on zinc anodes during the performance of the electrogalvanizing process is lead. Lead is the principal impurity in zinc and it does not dissolve in the electrogalvanizing solution, but remains on the surface, gradually accumulating as the zinc is dissolved away. The purest zinc is the best for the purpose, but even this contains some lead. Anodes should be frequently scrubbed to remove this lead or it will finally impede the passage of the current.

Lacquer Manufacture in Japan.

In the *Daily Consular and Trade Reports,* U. S. Consul-General Thomas Sammons at Yokohama, Japan, supplies the following information in regard to the manufacture of lacquer in Japan:

"Ye'no'abura" is a vegetable oil derived from the seeds of the Perilla ocimoides, an annual plant, which resembles the Perilla pekinensis, and uru'shi is the sap collected from the lacquer trees.

The oil is made in the Tochigi, Saitama, Chiba, Miyagi, and Ibaraki Perfectures, which are famous for the production of seeds and oil. Sandy soil is favorable to the cultivation of the plant, and the yield is estimated at 20 bushels of seeds per acre. Statistics show that the annual production throughout Japan amounts to an average of 325,000 bushels, from which over a gallon of oil per bushel is extracted. The oil is retailed at 35 cents per sho (0.4766 gallon), and is used in the manufacture of paper umbrellas, lanterns, oil papers, and artificial leather. It is also used in preparing materials for the manufacture of printer's ink, paint, varnish, and lacquer.

The lacquer trees are occasionally cut down, but the usual method is to tap them about 9 inches above the ground. The gum which accumulates is collected with a spatula made for the purpose. Four days after the first collection of gum the trees are tapped again. This process is carried on throughout the season ,July to September. The trees used are generally 15 years old. A large tree is estimated to produce 90 grams (3.17 ounces), while a small tree produces only 56 grams (1.87 ounces) of the gum.

There are three different grades of gum: (1) Ro'iro uru'shi, a superior quality, of a greenish black color, nonadhesive, and almost transparent when applied as a paint; (2) se'shi'me uru'shi, an inferior quality, brown in color, and owing to its adhesive properties, used for joint work, but not for painting; (3) hana'uru'shi ,a medium quality, resembling both the above in color and in adhesiveness, and purified by filtration through thin paper.

Refined lacquer contains 85 per cent of lacquer acid and 1 per cent. water and organic matter resembling rubber. The juice dries by absorbing oxygen, which it can do only when the atmosphere is damp. With the addition of a little glycerin, the drying process requires only two hours, whereas under normal conditions more than ten hours are necessary. Alcohol is used in melting the material.

The gum is sold direct to the dealers in lacquer, who refine the raw material themselves. It is first passed through a filter made of cloth into a porcelain or wooden receptacle, The waste remaining in the sieve is rejected, and the gum which may still adhere to its sides is mixed with the yeno and strained again into the receptacle. The resulting liquid is exposed to the air and, after being carefully stirred for a day or two, it attains a standard thickness. Heat is used to evaporate the water which may remain. Coloring matter, kneaded with yeno abura, is added to the material while it is raw.

New Books.

Hendricks' Commercial Register for the United States for Buyers and Sellers. New York. S. E. Hendericks Co., 74 Lafayette St. 1910 edition. (Nineteenth Annual Edition.) Quarto, 1342 pgs. Price, $10.00.

The 19th annual edition of this work has just been issued and is by far the most comcomplete that has yet been published. One hundred pages have been required for the index. The total number of classifications is 35,481, each representing some special tool, machine, appliance or article.

In every office, scarcely a day passes when the name of some manufacturer is not wanted. Large buyers, in sending out invitations for bids desire to know the complete list of manufacturer of certain machines, shop requitendents may wish to know the name of a manufacturer of certain machines, shop requisitions sent into the factory office may call for goods with which the purchasing agent is unfamiliar. When these conditions arrive, Hendricks' Commercial Register will solve the problem.

The book is a directory of the manufacturing and commercial interests of the United States and many a sound business has been built up by referring to its pages. It would be difficult to find an office that would not be benefitted by it.

The "Boland" Drying-Out Machine.

The machine herewith illustrated is intended for drying-out small metal goods after plating, coloring, dipping or pickling. It completely obviates the use of sawdust.

It is well appreciated that the use of sawdust in drying-out is accompanied with the disadvantage that the dried work contains particles of sawdust in the cavities and on the surface so that an extra operation is required for removing it. Then, too, sawdust is usually more or less dirty so that the goods may be discolored by it.

Fig. 1. The Machine for Drying by Hot Air Alone.

The machine is the invention of F. P. Boland of H. J. Astle & Co., of Providence, R. I., who was recently granted a patent upon it. It is made in two styles. No. 1 machine shown in Fig. 1 is operated by placing the material to be dried in the basket and holding it under the pipe. A blast of hot air is delivered from this pipe and dries the goods in the basket almost instantly.

In Fig. 2 a different type of machine is shown. In this style the work to be dried is placed in a basket as before, but instead of holding it in the hand it is placed on a revolving base. By means of a treadle two friction discs are engaged which rapidly rotate the basket. At the same time a blast of hot air impinges upon the work and immediately dries it. In this type of machine both the hot air and centrifugal motion are used so that the work is dried in the most expeditious manner possible. It is particularly applicable to the drying out of difficult work such as shells or other forms in which water will remain.

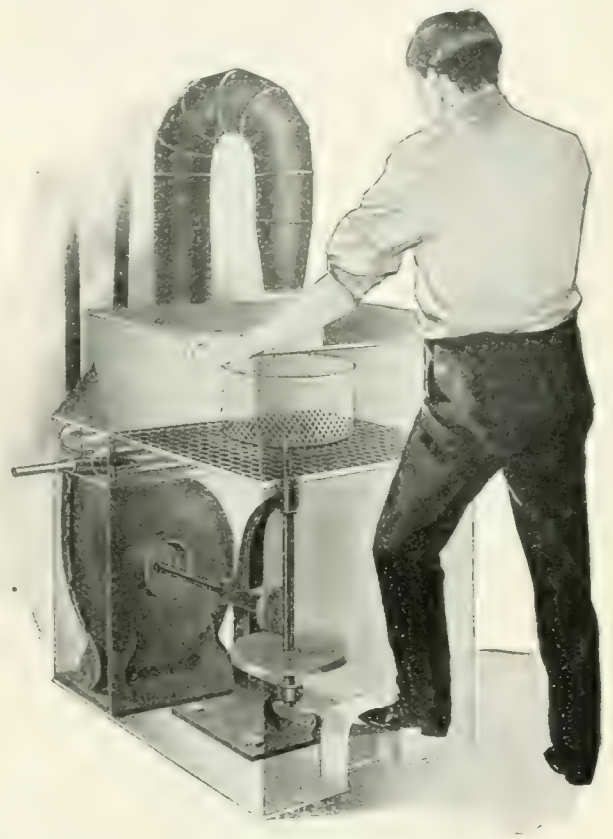


Fig. 2. The Machine for Drying Small Metal Goods by Means of Hot Air and Centrifugal Motion.

Another New Aluminum Alloy.

Another new aluminum alloy called "Clarus-Metal" has made its appearance in England. It is claimed that it is fully 60% stronger than ordinary aluminum, while the weight has been cut down to one-third that of brass.

In the tubing it is claimed that the strength is 38,000 lbs. per sq. in. against 22,000 lbs. in ordinary aluminum. The wire showed a strength of 89,000 lbs. per sq. in. against 28,000 lbs. in the case of ordinary aluminum. The metal is made by Gabriel & Co., 4 A. B. Row, Birmingham, England. No tests of sand castings are given.

The "Abbott" Tank Magnet.

The disadvantage or danger in allowing articles that have fallen to the bottom of a plating tank to remain there is not fully appreciated. In a nickel solution it is even more dangerous than in cyanide solutions for the reason that iron, steel, brass or copper articles are more rapidly acted upon. In a short time the solution becomes contaminated with the dissolved metal.

The " Abbott " Tank Magnet.

One reason, perhaps, why platers allow work to remain in the bottom of the tank is that it is difficult to extract it. In the case of small articles it is particularly difficult. In order to overcome this trouble and render the removal of the articles an easy matter, W. R. Abbott, the well known consulting plater of Chicago, Ill., has constructed a new appliance that he calls a "Tank Magnet." This magnet is herewith shown. It consists of a long rod upon the end of which is fastened an enclosed electromagnet. At the end of the rod two wires issue which are connected to the regular plating current. The magnet is then immersed in the tank and the iron or steel goods attach themselves to it and may be removed without any exertion. The magnet is well protected from the action of the solution and may be used in any kind of liquid.

This magnet is now being manufactured and placed on the market by the Hanson & Van Winkle Co., of Newark, N. J., and Chicago, Ill., who found it so useful that they decided to market it.

Notes on Melting Metals in a Vacuum.

The ideal method of melting metals is in a vacuum. It is theoretically correct as no gases are present to affect the character of the metal while being melted. While it has long been known that this method of melting is capable of giving results superior to any other, it has been so difficult to carry out in practice that its employment is limited to the melting of quite small quantities of metal.

The advantage of melting metal in a vacuum lies in two things:

1. There is no oxidation.
2. Gases present in the metal are expelled.

Metals which hitherto were considered only as brittle substances and quite incapable of being rolled or drawn, are now produced, by simple melting in a vacuum, in a malleable and ductile condition. Examples of such metals are tungsten and tantalum which are now made in the form of wire for use in incandescent electric lamps. Were it not for the use of the vacuum furnace, such a feat could never have been accomplished.

The manner in which the vacuum furnace is constructed has not been generally known. In *Berichte* 43, 1910, pages 1564-1575, O. Ruff describes the furnace and cites experiments made with it. The furnace he describes is known as an "electric vacuum furnace" and it consists of tube of retort carbon, turned down until its walls are about 1-1½ mm. in thickness. Two slits opposite one another, are provided in this tube for allowing the crucible to be seen, or for use of the pyrometer. If the resistance of the tube is to be further increased, more slits are cut in it, thus diminishing the conducting area. Over the ends of the tube there slide well fitting stout jackets of retort carbon, coppered on their outer ends, where they make contact with water-

cooled iron blocks to which the binding screws for the current are fixed. The whole is covered with a non-conducting jacket, and enclosed in a water-cooled brass case. This case is furnished with two view holes glazed with quartz glass, and provided with the necessary connections for exhausting the air for the production of the necessary vacuum.

Tubes are also provided which permit either the passing of various gases through the furnace-tube, or of introducing through stuffing boxes the wires of a pyrometer into the crucible. According to the thickness of the tube, 200 amperes at 15-18 volts give a temperature in the crucible, as measured by a Wanner pyrometer, of 1000°-1300°C., and 650-700 amperes at 28-40 volts, a temperature of 2000°-2700°C. Higher temperatures are impossible on account of the rapid volatilization of the carbon.

With a good vacuum, the reducing effect of the atmosphere in the furnace is, even at the highest temperatures, very slight. By substituting water-cooled carbon electrodes for the iron blocks bringing the current, the furnace can also be used as an arc-furnace.

The author used this type of furnace for the preparation of 96-97 per-cent vanadium metal by the reduction of vanadium oxide made into a paste with starch. The melting points of various materials were determined by watching for the sinking down of cones made from them and heated in the carbon crucible. The temperature of the crucible was then taken as the melting point. The accuracy of this method was, the author states, within 50 degrees of the truth. Some of the results obtained upon the melting point of substances are as follows:

Platinum, 1745°-1755°C. Molybdenum, 2110°C. Iridium, 2210°-2225°C. Kaolin, 1910°-1915°C. Tungsten, 2575°C. Titanium (containing 5% of carbon) only showed signs of fusing at 2700°C. Alumina, lime and magnesia were found to be so readily volatile that their melting points could not be determined in a vacuum. In nitrogen, alumina melted at 2065°C., lime about 2035°C., with the formation of a mass of felt like needles. Magnesia remained unmelted at 2400°C.

The spotting out of iron castings may frequently be overcome by first nickel plating them previous to copper or brass plating.

The "Meaker" Platers' Magnet.

Good platers fully recognize the annoyance and danger of allowing articles, that have dropped from plating racks or baskets, to remain in the bottom of the plating tank. The usual method of removing them is to scoop them out from time to time. Many platers allow the articles to remain in the bottom of the tank until the solution is thrown away,

The "Meaker" Platers' Magnet.

and it is particularly bad practice to do so as the character of the plating solution is always affected by it or absolutely ruined. On the other hand, one can hardly blame a plater for allowing articles to remain in the bottom of the tank as it is not only quite a task to remove them, but the solution is stirred up so that it may require several days to settle and become restored to its original condition.

Again, the fact that articles have actually dropped in the tank may not be known.

Realising that the maintenance of plating solutions in a good condition demands that articles dropped in the bottom of the tank shall be recovered as soon as possible, the Meaker Company, 218 North Elizabeth St., Chicago, Ill., the well known manufacturers of electrogalvanizing apparatus and solutions, have designed and constructed a "Platers' Magnet" that is rendering the removal of the lost iron or steel articles so simple that there can be no excuse for allowing them to remain in the bottom of the plating tank. The magnet is herewith illustrated.

The magnet is 4 feet in length and weighs 7lbs. packed for shipment. It will lift 15 lbs. The end is supplied with a wooden handle and the wires protruding from it are simply attached to the anode and cathode rods of the plating tank. The coils are made alkali and acid proof and are wound for any voltage of current from 3 to 15 volts. No skill is required in the use of the magnet.

An Improvement in Electrotyping.

An improvement in electrotyping has been patented by Francis J. McElhone of Jersey City, N. J. (U. S. Patent, 973,951, Oct. 25, 1910). The method is carried out as follows:

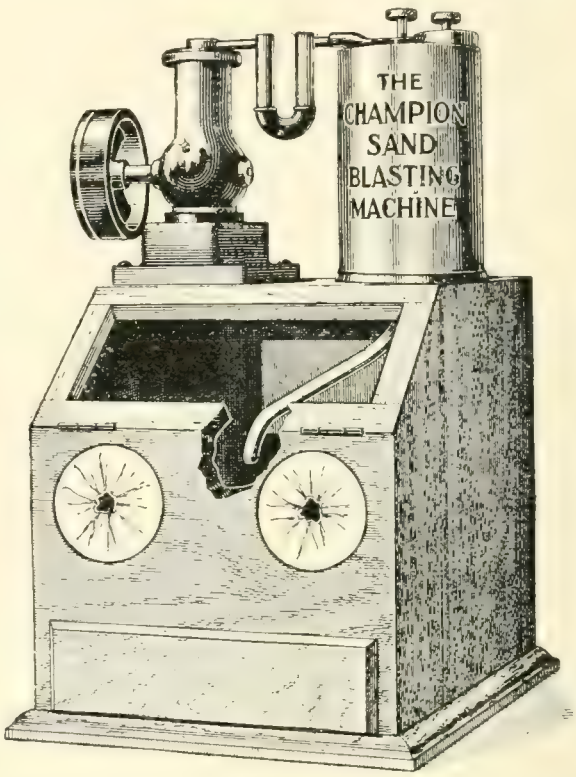
The wax case is made in the usual manner and blackleaded, and it is then washed off with a rose nozzle and immersed in a solution of pyrogallic acid containing 80 grains of the acid to 1 gallon of water. The surface is then brushed with a soft brush and again washed off with water. It is then ready for the regular electrodeposition with copper.

The "striking-up" with iron filings and copper sulphate solution is avoided and the scratching caused by such an operation is eliminated. The inventor claims that the treatment with the pyrogallic acid renders the graphite sufficiently conducting to obviate the striking with the iron filings.

Coffin hardware and soft metal novelties are rarely made of any other mixture than one composed of about 87% of lead and 13% antimony. It has been found to do all that is necessary and is the cheapest of any mixture that can be employed for the purpose.

A New Sand-Blast for Treating Small Work.

A new form of sand-blast for treating small articles has been placed on the market by the U. S. Electrochemical Co., 78 Lafayette St., New York City. The blast may be used by connecting the pulley to a motor or a foot power appliance. The sand after having been



The "Champion" Sand Blasting Machine Operated by Foot or Power.

used falls into the bottom of the chamber and may then be removed and placed in the sand hopper again. The top of the chamber is provided with a glass so that the progress of the work may be watched. Two hand holes with cuffs allow free use of the hands in holding the work without any dust escaping.

The cause of "spitting" in fine silver, when cooling from the molten condition, is the expulsion of oxygen that has been absorbed during the melting.

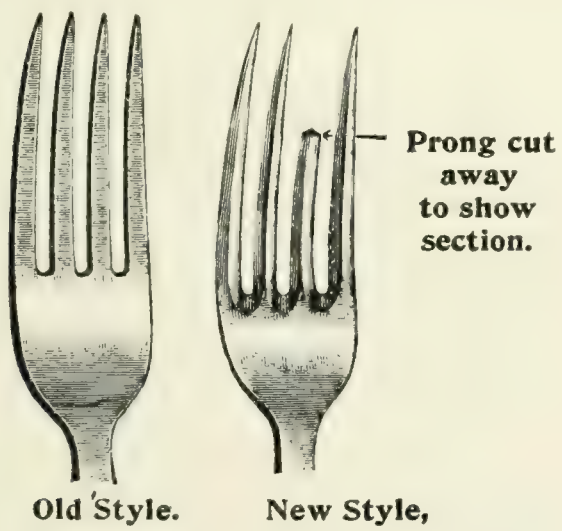
Good results are obtained in etching by first "backing off" the article upon which the resist has been painted, in an acid copper solution containing plenty of free acid, and then finishing in a solution of chlorate of potassium in muriatic acid. This solution gives an excellent matt background that is not produced by the acid copper solution or in any other manner.

New Alloys for Use in a Thermo-Electric Couple.

Two new alloys for use in making a thermo-electric couple for the working end of a pyrometer have been patented by Albert M. Marsh of the Hoskins Mfg. Co., of Detroit, Mich. (U. S. Patent, 971,767, Oct. 4, 1910.) The alloys are composed of a mixture of 98% of nickel and 2% of aluminum for one wire of the couple, and 90% of nickel and 10% of chromium for the other wire. The inventor states that the use of such a couple gives a practically straight line electro-motive force-temperature curve through the range of temperature of 25° C. to 1400° C. The adherence to the proportions given must be made in order to obtain such qualities.

Improvement in Fork Manufacture.

An improvement in table forks has recently been patented in Great Britain by C & H. W. Longbotham of Bradford, England. As this may be of interest to flat-ware manufacturers, an illustration is herewith shown.



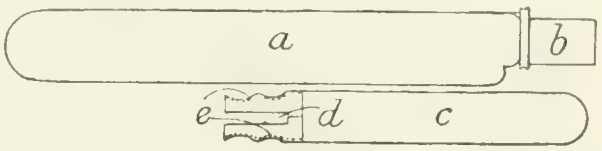
An Englishman's Idea of Fork Improvement.

The feature consists in making the tines diamond shaped instead of flat as shown. The claim is made that the fork is more readily cleaned than the old shape.

While hot nickel solutions deposit nickel more rapidly than cold ones with a given voltage (*i. e.* the conductivity of the solution is increased), it is generally considered that the results are not enough better to warrant their use for the ordinary run of work.

Improved Method of Fastening Knife Handles.

An improved method of fastening knife handles to a steel blade has been patented in England. The blade, *a*, having a short, flat tang *b*, is secured in a slot *d* in a non-metallic handle *c* by two pieces of stamped metal *e*,



English Improvement in Fastening the Knife Handle to a Steel Blade.

corrugated to suit the corrugations at the top end of the handle, and pressed on to same after the insertion of the tang. The two are then united by soldering.

Phosphor-bronze should not contain too much phosphorus. Its tensile-strength is greater when the phosphorus is low and it casts sounder. For sand castings from 0.10 to 0.25 per-cent of phosphorus may be considered the maximum. For rolling into sheet, 0.05 per cent is as much as can be used.

Aluminum chips, as now found in the scrap metal market, frequently contain more or less babbitt-metal chips which will alloy with the aluminum when melted down. Owing to the fact that the babbitt-chips are practically the same color as the aluminum, they are difficult to detect.

The largest electric motor in the world is now being made in Stafford, England. It will have a capacity of 10,000 horse-power and will neigh nearly 200 tons. A 920 volt current will supply it. The commutator will be 12 feet in diameter. The motor will be used for driving a steel rolling mill.

When nickel plating solutions are agitated and a high current density is used for the electrodeposition of the nickel, the deposit contains more iron than when still solution and low current density are employed. Owing to the fact that all commercial nickel anodes contain iron, nickel solutions, particularly when old, contain it to a greater or less extent.

Questions and Answers.

QUESTION No. 886. We are having trouble with a sulphite bronze mixture composed of 86 lbs. of copper, 5 lbs. of tin and 9 lbs. of lead. We are using scrap copper wire, scrap lead and ¼ lb. phosphor-copper to 100 lbs. of the mixture. When our castings are machined, they are full of blow-holes and the lead seems to sweat right through the castings. What causes our trouble?

Answer. We advocate the use of more phosphor-copper as you are using so much scrap that some deoxidizing agent must be employed to reduce the oxide. Use 1 lb. of 10% phosphor-copper instead of the quantity you mention, and if you still find that you have difficulty, melt your metal twice and we think you will succeed in overcoming it.

QUESTION No. 887. At the present time, I am finishing my old brass work as follows: I cut it down with composition and then sand buff it with pumice and sand. Rinse in cold water, then in hot water and dry in sawdust. It lays three or four hours before lacquering. When ready for lacquering, however, it is stained or tarnished. How can I prevent this stain?

Answer. You will find it quite difficult to preserve your brass from tarnishing for any length of time. The surface is chemically clean and is easily tarnished. Possibly your rinse water and sawdust are dirty. We suggest the use of the cold rinse water only as this is usually kept running and is clean, while hot water is kept in a barrel and is dirty. Sawdust, too, frequently is dirty from long use. You cannot preserve the brass very long, however, if dry and if it must be kept after sand buffing, suggest rinsing in cold water and then immersing in clean, cold water to which a small quantity of cream of tartar has been added. This will keep the brass from tarnishing and it can be dried out immediately before lacquering.

QUESTION No. 888. We notice that cobalt is now being used in the manufacture of special alloys. Is it produced in this country and by whom?

Answer. Cobalt is produced by nickel smelters, and the amount of metallic cobalt consumed has heretofore been quite small. New uses for it are now being found. The principal use for it has been in the coloring of glass, but the oxide or salt of cobalt is used for this purpose, and as an extremely small quantity will color glass, the consumption in this line is not large. Glass is colored blue by it. There is no real market price for metallic cobalt, as near as we can find, but one will probably be established as soon as a constant demand is created for it.

QUESTION No. 889. What is the advantage of a bright silver deposit that many of the manufacturers of silver-plated flat-ware are now using?

Answer. There are two advantages of a bright silver deposit:

1. It obviates the necessity of scratch-brushing, thus doing away with one operation.

2. It allows a much higher current density to be employed in depositing the silver. Over three times the quantity may be employed. This means, of course, that the same amount of silver may be deposited in one-third the time. It will readily be understood how valuable this feature is.

QUESTION No. 891. I have gold that I have obtained from a lot of old jewelry, and which I thought was pure. I wish to make pure, fine gold anodes from it, but it cracks to pieces in rolling. What is the reason?

Answer. Your gold contains some impurity. What we cannot say. It may be possible, if the quantity is small, that you can remove it by melting the gold and adding nitre. This will oxidize the impurities. A very small quantity of antimony, bismuth, lead, arsenic or tin will cause the gold to crack. You apparently have not obtained pure gold in reclaiming it from the old jewelry.

QUESTION No. 892. What is the meaning of the term "Prime Western" spelter that is used in the zinc trade?

Answer. The meaning of the term "Prime Western" is that the spelter is made from Western ores, usually from those of Missouri or Illinois. It is really a medium grade of spelter and contains about 1.00% of lead. It is used for ordinary brass work. The term is not particularly definite as it may be used for spelter produced in sections other than the West. It represents the average product of Western zinc smelters.

QUESTION No. 893. We had a 60 gallon nickel solution to which we added 8 lbs. of sal-ammoniac and it worked well. We then made a larger solution of 130 gallons, putting in the 60 gallon solution, 50 lbs. of double salts and some old nickel solution that had been in use about a year and which had been used for plating iron. The solution was very acid so we added over 2 gallons of ammonia and this did not neutralize it. When we put in work, it covers quickly, but in most cases the deposit stops in about 10 minutes. The current strength is all right, but no matter how long we keep the work in, it will remain bright and not become dead as it should. What is needed or what shall we do with it to make it plate right?

Answer. Your solution acts as though it is deficient in nickel. The fact that you get a deposit of good color etc. but which is thin indicates it. If the solution is too acid, as you think it may be, it will not plate at all. We suggest the use of single nickel salts (sulphate of nickel) to it as this will introduce sufficient nickel to give what is necessary. Your solution contains a large amount of

ammonia salts which does no harm of course, but you must have nickel in the solution. Add about 2 oz. of single nickel salts to each gallon. We feel sure that you will have no further difficulty when you do this.

QUESTION No. 894. I am making a water-service elbow and am casting a tail into an elbow. The tail is knurled and tinned and then inserted in the mold after which the brass is cast around it. The tail is of iron. At the joint, when cast, a leakage always occurs after testing at a pressure of 300 lbs. per sq. in. The defective ones vary from 10 to 50%. What is the cause?

Answer. The problem is a difficult one to solve without actually seeing the defective castings, but we suggest that it may be caused by the presence of oil or grease on the tail that has been tinned. See that the tail is clean and set into the mold when cold so that it will not become covered with moisture while standing. Do not set them in the mold too long before pouring.

QUESTION No. 895. I have an old silver solution. The silver deposit from it is rough, even with a weak current and I believe it is caused by the presence of too much carbonate of potash. I am thinking of using prussic acid. Is there any other way to fix it?

Answer.. The fact that the solution plates rough does not always mean that it is caused by carbonate of potash. It is frequently caused by the use of too strong a solution. The solution, as you no doubt know, is constantly evaporating and becoming stronger. See if it does not stand too high by the hydrometer test. If so add water until it is brought down to about 8 to 10 degrees Beaume'. The use of prussic acid is not advised as it has never been found to be satisfactory although frequently recommended. Barium cyanide is the substance to use for decomposing the carbonate of potash, but, unfortunately, it is not on sale in the United States although used in Germany.

QUESTION No. 896. We are sending you a sample door handle for an automobile. This handle was cast in yellow brass made by melting sheet brass clippings, entirely clean. The castings, as you will notice, contain a large number of pin-holes. We are not using any aluminum in the mixture as we understand that this will cause the pin-holes. Is there any way of overcoming the pin-holes?

Answer. The trouble with your castings is that you are melting too bulky scrap. There is too much surface exposed during the melting. Then, too, you may be overheating it. In the case of small scrap, such as chips or sheet scrap, it is customary to melt it and pour into ingots. Then remelt it and pour into the castings. In this manner excessive oxidation and gas absorption are avoided. You should use a little aluminum in the yellow brass as, contrary to your belief, it does not produce pin holes but serves to remove them. Nearly all the makers of automobile and saddlery hardware use a small amount of aluminum in their yellow brass. About 2 or 3 ounces of aluminum to 100 lbs. of brass is the customary quantity. When aluminum is used, however, you will have to pour at a much lower temperature than in the case of brass without it. Unless this is done, the castings will be "drossy". When poured at the right heat, however, yellow brass containing aluminum is exceptionally sound and takes a high polish without showing pin-holes.

QUESTION No. 897. I am having a great deal of trouble an account of the formation of green crystals in a sulphuric acid pickle used for pickling cast-iron. After using a day or two it crystallizes and becomes useless. How can I prevent it?

Answer. You are using the pickle too strong. The fact that crystals of sulphate of iron are deposited shows that action has taken place, but as these are more soluble in water than in sulphuric acid, they do not remain in solution. The addition of water will solve your problem. As we do not know at what strength you are using your pickle, we do not know exactly what to suggest as it may be possible that you are using the pickle until it is exhausted and in this case it will deposit crystals. The use of about 9 parts of water and 1 part of sulphuric acid for the pickle is satisfactory, and if it then deposits crystals, it indicates that it is exhausted and should be thrown away.

QUESTION No. 898. How can brass turnings be separated from aluminum turnings?

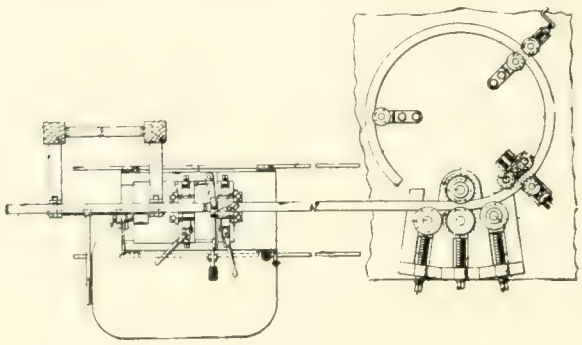
Answer. We do not know of any method by which they can be separated in an economical manner, and they will have to be used as they are, or sold for copper contents. You should keep the two kinds of chips separate in making them.

QUESTION No. 899. We have had some complaint about our silver anodes. We have some customers who are plating silver on zinc and britannia-metal and they say that the silver does not plate well and the "carbon is drawn from the anodes." Does the carbon come from the small quantity of lampblack we use on the molds in casting the silver? We also use soda-ash in melting the silver. Anything that you can do will be appreciated.

Answer.. Silver does not take up carbon in melting and your difficulty is not caused by it. The lampblack on the mold has no influence on the silver. The trouble is apparently caused by the use of too light a coating of silver on the zinc or britannia-metal. It is a well known fact that light coatings of silver (and copper and brass as well) are absorbed by zinc or other soft metals after a time and then the base metal turns black. This seems to be what your customer is doing. In the manufacture of coffin hardware made of lead and antimony, it is customary first to nickel plate it and then deposit a very light amount of silver on it. Unless the lead and antimony castings were first nickel plated, the silver would soon soak in and the surface would turn black. The trouble is with your customer and not with your silver.

Patent Abstracts.

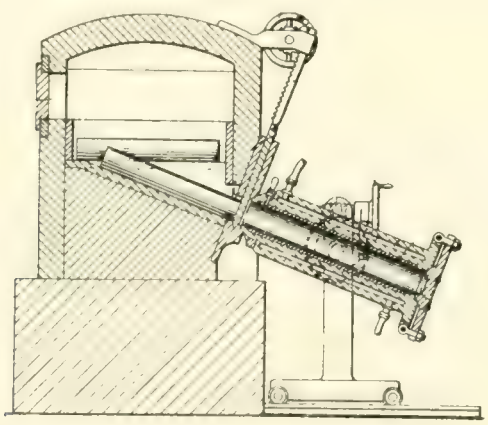
972,928, Oct. 18, 1910. PROCESS OF MAKING LONG PIPE COILS. Leopold C. Schneider of Philadelphia, Pa. Assignor to the Philadelphia Pipe Bending Co. A pipe



bending machine for taking long lengths of pipe and bending them, and at the same time swaging the joints of each pipe section while the pipe is being coiled.

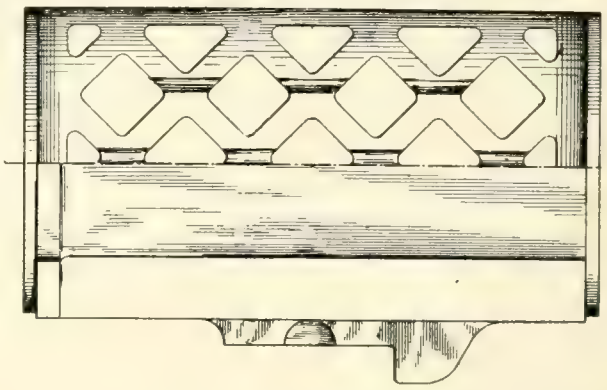
965,878, Aug. 2. 1910. MANUFACTURE OF PATTERNS AND MOLDS. Albert Deville of Charleville, France. A method of molding thin articles, such as hollow-ware in a molding machine in which the ramming is done both inside and outside. In order to strengthen the pattern, it is made in parts calculated to stand the ramming, and so that each part may be displaced in a parallel manner to obtain a thick wall.

972,561, Oct. 11, 1910. METHOD OF AND APPARATUS FOR PRODUCING COPPER COATED METAL OBJECTS. John F. Monnot of New York, N. Y. Assignor to the Duplex Metals Co., of the same city. A method of making copper coated steel billets. The



steel billet is heated in a furnace with a flux and while in this heated condition is transferred to a mold and copper poured around it. As noticed from the illustration, the object is to prevent the oxidation of the steel billet and it is slid from the furnace to the mold without coming in contact with the air.

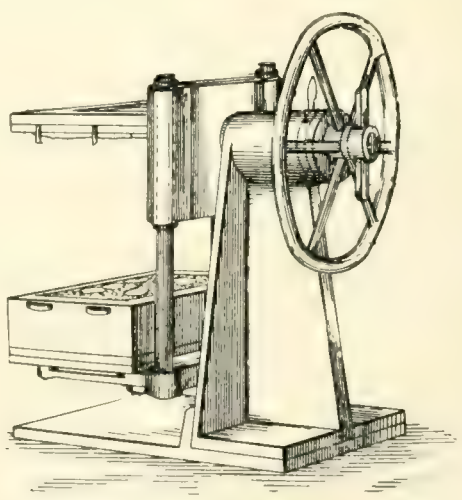
971,085, Sept. 27, 1910. JOURNAL BRASS. Henry J. Small of San Francisco, Cal. A journal brass intended more particularly for use on railroad cars. The back is made of



malleable iron, the bearing portion of bronze and the filling of babbitt. The construction is such that both circumferential and longitudinal movements are prevented.

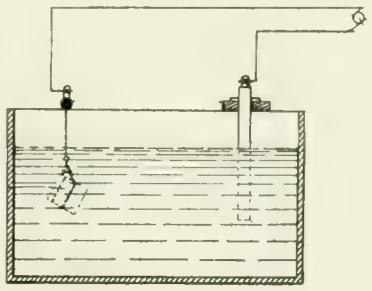
972,135, Oct. 4, 1910. PROCESS OF DETINNING. Franz Von Kügelgen of Holcombs Rock, Va., and Geo. O. Seward of East Orange, N. J. Assignors to the Tin Products Co., of New York City. The feature of the patent lies in the use of dry chlorine gas for removing the tin and keeping the temperature down to about 100° F. or lower. At this temperature the iron is not attacked, and the tin is removed as stannic chloride.

927,851, Oct. 18, 1910. MOLDING MACHINE. George L. Grimes of Detroit, Mich. A molding machine for making sand molds in which means are provided for readily



handling the flask during the operation of making the mold. Another feature is the method of locking the rotating frame supporting the flask while the mold is being formed.

971, 641, Oct. 4, 1910. ART OF ENAMELING METALS. Geo. L. Rice and Benjamin W. Gilchrist of Woodhaven, N. Y. A process of enameling such articles as sheet steel cooking utensils. It is claimed that by first electroplating the steel with a deposit containing sulphur, such as, for example, a black

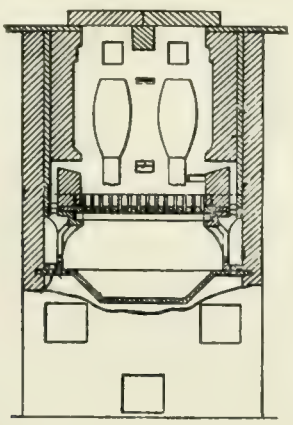


nickel deposit, the enamel, when baked upon it, will adhere more tenaciously and be more free from flaws than when the enameling is done directly upon the steel. The method employed by one establishment, manufacturing cooking utensils, is to give the steel a white nickel deposit previous to the enameling, but the use of the black nickel is an improvement.

967,012, Aug. 9, 1910. MOLD. Heinrich Gasche and Karl Wensky of Frankfort-on-the-Main, Germany. A process of forming a skim gate on a sand mold in order to prevent the entrance of slag and dross.

973,574, Oct. 25, 1910. COMPOSITION OF MATTER FOR FOUNDRY CORES. Charles A. Schleicher of Troy, N. Y. Assignor to the Standard Compound Co., of the same city. The use of petroleum coke or petroleum asphaltum as a binder for core sand in place of rosin is claimed. A mixture of 1 part with 30 parts of sand is recommended. The advantage of cheapness is claimed.

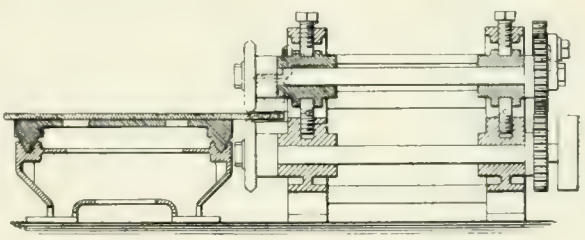
972,703, Oct. 11, 1910. CRUCIBLE FURNACE. William Miller of Wellington, England. A crucible furnace adapted more particularly for melting steel, although applicable



to other metals as well. The feature of the furnace lies in the use of the regenerative combustion. Coke is used as the fuel.

972,079, Oct. 4, 1910. METHOD OF AUTOGENOUS WELDING, CUTTING OR SOLDERING METALS. Berthold Hoffmann of Griesheim, Germany. Assignor to the Chemische Fabrik Griesheim-Electron of Frankfort-on-the-Main, Germany. The inventor claims that by the use of ethane gas instead of acetylene in the welding of metals by the autogeneous process, many of the defects of the process may be eliminated. The ethane gas is used in place of the acetylene in the ordinary blowpipe in conjunction with oxygen. The brittleness of the weld caused by carbonization, it is claimed, is obviated. It is also claimed that a higher temperature may be obtained by the use of the oxy-ethane flame.

973,376, Oct. 18, 1910. PROCESS OF AND APPARATUS FOR CUTTING COMPOUND METAL ARTICLES. John F. Monnot of New York, N. Y. Assignor to the Duplex Metals Co., of the same city. A method of cutting a compound copper and



steel plate so that the plate will be severed neatly and the coating metal folded over so that the edges of the steel will be protected. The operation is performed by a sort of crushing process followed by the severing so that the copper is forced down to cover the edge.

9 72,559, Oct. 11, 1910. ART OF HOT WORKING METALS. John F. Monnot of New York, N. Y. Assignor to the Duplex Metals Co., of the same city. A process for preventing the oxidation and gas absorption by metallic nickel while being rolled or otherwise worked hot. The nickel billet is encased in a thin copper or bronze casing while being rolled or worked hot and is thus protected from the atmosphere. It is claimed that the method is equivalent to working the nickel in a neutral atmosphere.

971,045, Sept. 27, 1910. MOLD FOR HOLLOW ARTICLES. E. Kerr and J. Smith of Pittsburg, Pa. A method of casting blast furnace tuyeres. The feature of the patent is in the manner of supporting the core and holding it during the casting.

Trade Items.

The Dayton Scale Co., of Dayton, Ohio, scale manufacturers, have purchased a plot of ground in Toronto, Canada and will erect a Canadian factory there.

The Cleveland Tensilite Co., 1413 Brownell Court, Cleveland, Ohio, is now manufacturing "Tensilite" which they state is a "purifier and assimilator par-excellence for all ferrous and non-ferrous metals."

The new plant of the Victor Safe & Lock Co., at Norwood, near Cincinnati, Ohio, is now practically completed and the company will move there within a short time. The manufacture of safes and locks is carried on.

The Fostoria Aluminum Mfg. Co., of Fostoria, Ohio, manufacturers of aluminum and brass castings, are to move to Mishawaka, Ind. A foundry of concrete 65x95 feet will be built and a pattern storage building 22x24 feet. New equipment will be purchased.

The Bristol Company of Waterbury, Conn., manufacturers of recording instruments and pyrometers, are sending out to the trade a number of their new Bulletins describing new forms of instruments recently placed on the market. These are Bulletins 126-128-129-135-141-145-146 and 147. Recording thermometers, thermometer-thermostats, shunt ammeters, recording pressure guages etc. are illustrated and described. They will be sent to those who desire them.

F. A. Shepherd, formerly of the International Plating Co., 137 Washington St., Buffalo, N. Y., has assumed the management of the Kortum-Manufacturing Company, 10-12 Pearl St., Buffalo, N. Y. This company are dealers and manufacturers in platers' and polishers' supplies, and are best known on account of manufacturing the "Compressed Linen Polishing Wheels." They also make the "Zircon Metal Polish." Their line will now be greatly increased, however, and everything necessary in the plating and polishing line will be stocked. Mr. Shepherd is an expert plater and expert advice will be given by him whenever necessary.

An exhibition of foundry facings, equipment and supplies was recently given at the Chicago plant of the S. Obermayer Company of Cincinnati, Ohio. It is believed that this exhibition was the first of its kind ever held in the United States. Large show rooms were fitted up for the display of supplies and equipment and over 400 people availed themselves of the opportunity to visit the exhibition. A complete set of brass furnaces, Ding's magnetic separator, water tumbling barrel and all the accessories used in a foundry. Molding machines, core ovens, riddles, flasks of all varieties and every kind of device made by the Obermayer Company were displayed. Later the visitors inspected the plant of the company in Chicago where a lunch was served.

The brass foundry of Martin Reynolds & Son, 68 Richardson St., Brooklyn, N. Y. was damaged by fire on Oct. 14th. to the extent of $20,000.

The buildings of the Phoenix Wire Works of Detroit, Mch., that were recently damaged by fire, are being rebuilt and it is expected that the plant will be in full operation by the end of the month.

The Griffin Mfg. Co., of Erie, Pa., manufacturers of sheet steel builders' hardware, both plated and japanned, are now operating a cold rolled steel plant in which steel for their own use is made.

The new plant of the Electrolytic Products Company of Buffalo, N. Y., is nearing completion. It is located at Elmwood & Hertel Avenues and will be used for the manufacture of automobile radiators by electrodeposition. The installation of the equipment will soon begin.

The Capitol Brass Works of Detroit, Mich., manufacturers of plumbers' brass goods, are contemplating the erection of an addition to their plant that will give them 30,000 sq. feet more of room. This will practically double their capacity. The company will also commence the manufacture of a new line of water gauges and compression gauge cocks.

The International Chemical Co., Camden, N. J., manufacturers of cleaning compounds for metal manufacturers, desire to call the attention of platers to the K. W. T. Cleaner ("kleans without tarnishing") which they have been supplying to the trade for some time with the best of results. It is intended for cleaning highly colored brass, copper, bronze etc., when it is important that the surface shall not be tarnished before plating. It is particularly useful in cleaning work for gold plating. Full information will be sent upon request.

The Backus & Leeser Company has been organized at 410-412 West 13th. St., New York City to conduct a general plating and polishing supply business. The senior member of the company is Clarence G. Backus, formerly superintendent of the Zucker & Levett & Loeb Co., with which he was associated for 12 years. Mr. Backus is an expert in the plating and polishing line, having been superintendent of a number of large metal goods concerns, previous to his association with the former company. Charles B. Leeser, the junior member of the firm, was credit manager for four years for the Zucker & Levett & Loeb Co., and is closely identified with the trade. The company will represent the Harshaw, Fuller & Goodwin Company of Cleveland, Ohio, the Eager Electric Company of Watertown, N. Y., and the Keystone Emery Mills of Philadelphia, Pa. They will, therefore, be able to supply their customers with the highest grade of goods.

A new factory has been started at 400 Richardson Building, Newark, N. J., by N. J. Fisher and the manufacture of pins, buckles etc., will be carried on.

The Cadillac Motor Car Co., of Detroit, Mich., manufacturers of automobiles, are considering the erection of a branch plant in Nashville, Tenn.

The brass foundry of the Arcade Mfg. Co., of Freeport, Ill., is being considerably enlarged. A number of molding machines have been added.

Edmunds & Jones, Detroit, Mich., manufacturers of automobile lamps, are preparing plans for an addition to their plant. This addition will be 67x200 feet and three stories high.

The capital stock of the Champion Safety Lock Co., of Geneva, Ohio, lock manufacturers, has been increased from $75,000 to $100,000. Extensive additions to the plant will be made.

The Columbian Hardware Company of Cleveland, Ohio, manufacturers of builders' hardware, have gone into the hands of a receiver. L. A. Cobb, the president of the company, has been appointed receiver.

The Bunting Brass & Bronze Company of Alliance, Ohio, brass and aluminum founders, have begun work on their new brass foundry in Toledo, Ohio. This foundry will be 54x200 feet and of steel and brick construction. When completed, the business will move from Alliance to Toledo.

The Buckeye Aluminum Co., of Doylestown, Ohio, manufacturers of aluminum cooking utensils, are to move to Wooster, Ohio, where a new plant is to be built. The factory site has been given the company and a bonus of $12,000 also with the agreement that an average of 75 men shall be employed for 10 years.

The Duplex Metals Company, manufacturers of copper coated steel wire and sheet, are adding a one story building, 50x70 feet, to their works at Chester, Pa. The main office of the company will be located there. The present office and show rooms will still be located in New York City in the Singer Building. Branch offices will also be established in St. Louis, Mo., and Portland, Oregon.

The Baird Machine Company of Oakville, Conn., manufacturers of automatic machinery, tumbling barrels and presses, have found it necessary, on account of the expansion of their business, to build a new and extensive plant and have, therefore, purchased a plot of land in Stratford, Conn., near the Bridgeport city line, upon which a large factory will be erected. The land borders on both the N. Y. N. H. & H. R. R., and the suburban trolley line and all the facilities for manufacturing and shipping that could be desired have been obtained. Work will be commenced as soon as possible. The company have been located in Oakville since 1892.

The Canada Cycle & Motor Co., of Toronto, Canada, are to erect a new four story factory on Weston Road in that city.

Ahrendt & Kautzman have started in business at 613 Hunterdon St., Newark, N. J., and will manufacture gold and silver novelties, such as match boxes and cigarette cases.

The Durlacque Mfg. Co., have started in the manufacture of lacquers at 2322 Olive St., St. Louis, Mo. High grade lacquers and a bronze protector are manufactured. A . R. Picker is the president of the company.

Two new buildings will be erected by the Central Oil & Gas Stove Company at Gardner, Mass., manufacturers of oil and gas stoves. One of the buildings will be 60x200 feet and the other 40x60 feet. Work will be started this fall.

The complete list of the creditors of the Bay State Brass Co., of Haydenville, Mass., manufacturers of plumbers' goods, recently filed, shows that the claims aggregate $82,000. of this about $50,000 is owed to banks. This company recently went into bankruptcy.

The Hawley Down Draft Furnace Co., of Chicago, Ill., have placed on the market a new portable furnace for brass melting that may be carried, by means of a travelling crane, from place to place and molds poured directly from it. The furnace is of the regular type made by this company and the improvement is in the manner of rendering it portable.

It is stated that the business of the Vanadium Metals Company of East Braintree, Mass., will be moved to Groton, near New London, Conn., and a large brass foundry will be built there. The company, it is said, will be affiliated with the new New London Ship & Engine Building Co., recently organized to take the plant of the Eastern Shipbuilding Company at Groton, near New London.

The three gate valves, reecntly constructed by the Chapman Valve Co., of Indian Orchard, Mass., for the Ontario Power Co., of Niagara Falls, Canada, are the largest ever manufactured. These valves are nine feet in diameter at the water way and each will control the water driving a 12,000 horse power turbin. Each valve weighs completed 130,000 lbs. The spindles are made of Tobin-bronze, 4½ inches in diameter. The body of the valve is of cast-iron and the seats of special bronze.

The United States Aluminum Co., of Pittsburgh, Pa., have purchased the exclusive right for the United States, of the rolling mill for embossing aluminum sheet that has recently been invented by Victor Chartner of the A. Garrison Foundry Co., of Pittsburg, Pa. The rolling mill is made by the latter company. It is used for embossing aluminum sheet for use in place of rubber for the matting on automobile steps etc., and will form the raised portions of the sheet without buckling. Aluminum matting is now extensively used, as it gives a firm hold for the foot and is cheaper and lighter than rubber.

An addition is to be made to the brass foundry of the Atlas Brass Foundry Company at Columbus, Ohio.

The new factory of the Racine Iron & Wire Works at Racine, Wis., is to be occupied about the middle of November and considerable of the equipment has already been obtained.

The new foundry of the Wolverine Aluminum & Brass Foundry Company at Jackson, Mich., has been completed and is equipped with six melting furnaces and modern appliances for the production of the best grade of goods.

The J. W. Paxson Company of Philadelphia, Pa., manufacturers of foundry supplies and equipment, have purchased the property adjoining their plant on North Delaware Ave., Philadelphia and which will be used for an ultimate enlargement.

The Globe Mfg. Co., and the Taunton Wire Nail Co., have consolidated under the name of the Globe-Taunton Nail Company. The business is located in Taunton, Mass., and the mangnesium-zinc alloy used for deoxidizing pins, rivets etc., is carried on.

The North & Judd Mfg. Co., of New Britain, Conn., the largest manufacturers of saddlery hardware in the United States, have commenced the manufacture of automobile hardware. This company makes both brass and iron goods.

The main factory of the Tulsa Automobile & Mfg. Co., at Tulsa, Oklahoma, is rapidly nearing completion and it is expected that it will be ready for occupancy by Dec. 1st. The company is capitalized at $200,000 and the manufacture of commercial automobiles will be carried on.

The Metals Supply Co., 72-74-76 Mechanic St., Newark, N. J., are about to commence the manufacture of solders for the plumbing and sheet metal trades. They have heretofore manufactured hot-air pipe, eaves, troughs, registers, conductor pipe etc. and are to increase their line by the manufacture of solders. While they have handled solders in the past, they have not manufactured them.

Rockhill & Vietor, 114 John St., New York City and Chicago, Ill., announce that hereafter they will ship all "None-such Plating Machines", for which they are sales agents, with the latest improvements of the inventor. This is in the form of extra fittings so that the tank may be used, when the occasion demands it, for regular rack work or ordinary plating. This is the latest improvement of the inventor.

The brass foundry of the Maxwell-Briscoe Motor Company, at Tarrytown, N. Y., manufacturers of automobiles, is now being equipped with the new molding devices of Hugh McPhee, the superintendent of the brass department. Mr. McPhee recently patented an improved method of molding which results in a large saving on loose work. The method was described at the Foundrymens' Convention at Detroit in May 1910.

The Imperial Cutlery Works at Avondale, N. J., have gone into the hands of a receiver.

A new plant is to be erected by the Champion Wire & Iron Works of Louisville, Ky., manufacturers of artistic metal work.

The new solder business of the Metals Supply Co., of Newark, N. J., will be operated under the name of the Routh Solder Co.

The Thomas Mfg. Co., of Dayton, Ohio, manufacturers of hardware specialties, are to erect a new factory, 175x250 feet, and three stories high. The building will probably be erected in the coming spring.

The Sherardizing Company of Illinois has been organized in Chicago, Ill., with a capital stock of $50,000. The office of the company is at 152 West 62nd. St., and electroplating is also to be carried on. A plant will be erected.

The Enterprise Brass and Plating Works, 2838 Spring Grove Ave., Cincinnati, Ohio, manufacturers of automobile and carriage hardware, have incorporated their company with a capital stock of $25,000.

The Morgan Register Co., has been incorporated in Anderson, Ind., to manufacture car registers. The capital stock is $100,000 and the directors of the company are F. A. Morgan, H .A. Mansfield, and H. C .Stillwell .

One half of the capital stock of the Crown Electrical Mfg. Co., of Brantford, Canada, has been subscribed by local parties. This concern was recently organized with a capital stock of $100,000 and as a branch of the company in St. Charles, Ill.

The Fremont Stove & Range Co., of Fremont, Ohio, has purchased the June factory in that city and will shortly commence the manufacture of stoves and ranges. This company was recently capitalized with a stock of $35,000.

The Clinton Wire Cloth Co., of Clinton, Mass., manufacturers of copper, bronze and steel wire cloth, have awarded the contract for a new factory, 100x275 feet, and two stories high. This will be used to replace the old building now standing on the land upon which the new plant will be erected

The Canada Metal Company, Ltd., of Toronto, Canada manufacturers of solders, babbitt-metal and similar white metal alloys, are to start a new plant in Winnipeg, Manitoba. They have purchased the plant of the Ontario Wind Engine & Pump Co., in that city and will build additions to meet their requirements.

The Mattoon Foundry & Machine Co., has been incorporated in Mattoon, Ill., with a capital stock of $25,000. A general foundry business is to be carried on and also the manufacture of steam metal valves. This valve is the invention of Charles N. Coon and John Cantlon of the company. The company has been organized by Charles N. Coon, John Cantlon Sr., Oscar C. Miller, William R. Ripley and Raymond Coon.

The Franklin Iron & Metal Co., has been organized in Battle Creek, Mich., to deal in scrap metal of all kinds.

The Model Brass Casting Co., have started a jobbing brass foundry at 36 Lounsbury St., Waterbury, Conn.

The J. Bernard Co., manufacturers of metal novelties, have taken a portion of the Hergert Building, 422 East 53rd St., New York City.

The capital stock of the Oven Equipment & Mfg. Co., of Stamford, Conn., manufacturers of drying ovens heated by gas, has been increased from $100,000 to $200,000. The business will be extended.

The firm of Huber & Bowers has started in business at 2210 Emerald St., Philadelphia, Pa., and will carry on the brass finishing business. A specialty will be made of altering, remodelling and refinishing of brass beds.

The Blakeman Mfg. Co., Inc. has been incorporated in Naugatuck, Conn., to manufacture gas and electric fixtures. N. A. Olson is the president, C. W. Thompson secretary and treasurer, F. A. Johnson manager and F. R. Blakeman superintendent.

The Edmunds & Jones Mfg. Co., Detroit, Mich., manufacturers of automobile lamps, are desirous of receiving catalogues from manufacturers of sheet metal machinery, electroplating equipment and supplies, electrogalvanizing and enameling processes and electric lamps and accessory devices.

The Providence Metal Spinning Co., 95 Pine St., Providence, R. I. is now making a specialty of automobile work. In addition to special spinning to order, they do saw and press piercing and make a variety of monograms. Automobile manufacturers or owners can obtain special monograms from them to order.

At the recent meeting of the Foundry & Manufacturers' Supply Association, the organization that conducts the exhibit at the Foundrymens' Convention each year, it was decided to wind up the affairs and distribute the balance of money on hand to the stockholders. A new organization, known as the Foundry and Machine Exhibition Company, will take over the affairs of the old organization and conduct the exhibit at Pittsburgh next year.

C. W. Leavitt & Co., 30 Church St., New York City, state that the demand for pure magnesium is increasing to a considerable extent. They are now placing on the market a magnesium-tin alloy, that is to be used for deoxidizing tin alloys of all kinds, and a magnesium-zinc alloy used for deoxidizing zinc castings. A new magnesium-copper alloy has also been placed on the market for use with the brasses and bronzes. In case magnesium is to be used in lead mixtures, a magnesium and lead alloy can be obtained from them. This latter compound, it is stated, makes the metal more liquid and reduces the amount of dross.

The Oriental Jewelry Co., has started in business at Providence, R. I., and will manufacture hand-made oriental jewelry. The factory is on Vinton St.

The Ryder Brass Foundry Co., has been incorporated at Bucyrus, Ohio, to conduct a jobbing brass foundry. Brass, bronze and aluminum castings will be manufactured and a machine business will also be carried on. The incorporators are Parmly H. Ryder, Arnold Lentz, E. W. Rider, A. S. Lenthold and S. Lenthold. The company has been capitalized with a stock of $10,000.

The Dayton Bronze Bearing Co., has been incorporated by William B. Israel and others. The capital stock is $20,000 and a specialty will be made of street car and similar class of bearings. The new concern takes over the business formerly conducted by Israel Bros., scrap metal dealers and brass founders.

Personal.

M. F. Legge, formerly Eastern representative of the Zucker & Levett & Loeb Co., is now representing James H. Rhodes & Co., 2 Cedar St., New York City, manufacturers of polishers' supplies, and will represent them in New England.

George Dicker, who has had a large experience in foundry work, has taken the position as superintendent of the new foundry of the Michigan Aluminum & Brass Foundry Co., at Jackson, Mich.

George R. Comings has been appointed chief assayer at the Government Assay Office in New York City, succeeding H. G. Torrey who has resigned. Mr. Comings has been connected with the office for thirty years.

Obituary.

John Harlin, founder of the McNab & Harlin Mfg. Co., of Paterson, N. J., one of the largest manufacturers of steam goods in the United States, died on Oct. 28th. He was 70 years of age and one of the pioneers in the manufacture of the steam metal valves.

Wm. McAvity of T. McAvity & Sons of St. Johns, New Brunswick, one of the largest brass goods manufacturers in Canada, died on Oct. 28th. He was in charge of the manufacturing end of the business and had been associated with the company for 45 years. His father Thomas McAvity was the founder of the company.

Philip Corbin, president of the American Hardware Corporation, and founder of the P. & F. Corbin Company, both of New Britain, Conn., the largest manufacturers of builders' hardware in the United States, died in that city on Nov. 3rd. aged 86 years. Mr. Corbin started the Corbin Company in a small way and employed only a few hands. He lived, however, to see it employ many thousands and to become one of the largest enterprises in the world.

Current Metal and Supply Prices.

These Prices are net and are for moderate quantities. Smaller quantities command higher prices. Prices subject to fluctuation.

Acetone, pure, 98-99%	lb.	.22
Acid, Acetic, pure, 30%	lb.	.07
Acid, Arsenious (White Arsenic)	lb.	.20
Acid, Benzoic	lb.	.55
Acid, Boracic (Boric), pure	lb.	.12
Acid, Hydrochloric, see Acid, Muriatic.		
Acid, Hydrofluoric, 30%	lb.	.04
Acid, Hydrofluoric, 50%	lb.	.10
Acid, Muriatic, 20°	lb.	.02
Acid, Muriatic, c. p., 20°	lb.	.07
Acid, Nitric, 38°	lb.	.05⅝
Acid, Nitric, 40°	lb.	.05⅞
Acid, Nitric, 42°	lb.	.06¼
Acid, Nitric, c. p.	lb.	.08
Acid, Sulphuric, 66°	lb.	.01¾
Acid, Sulphuric, c. p.	lb.	.06
Alcohol, Wood	gal.	.50
Alcohol, Denatured	gal.	.55
Alum	lb.	.04
Ammonium Sulphate	lb.	.07
Aluminum, Metallic, in Ingots	lb.	.22
Aqua-Fortis, see Acid, Nitric.		
Ammonia Water (Aqua-Ammonia), 20°	lb.	.04¾
Ammonia Water (Aqua-Ammonia), 26°	lb.	.06¼
Ammonia Water, c. p.	lb.	.08
Ammonium Carbonate, lump	lb.	.15
Ammonium Chloride (Sal-Ammoniac)	lb.	.12
Ammonium Hydrosulphuret	lb.	.30
Ammonium Sulphate	lb.	.07
Ammonium Suphocyanate	lb.	.50
Amyl Acetate	gal.	1.85
Antimony	lb.	.08⅛
Arsenic, Metallic	lb.	.15
Arsenic, White (Acid Arsenious)	lb.	.20
Argols, White (Cream of Tartar)	lb.	.31
Asphaltum, Commercial	lb.	.05
Asphaltum, Egyptian (Bitumen)	lb.	.30
Benzine	gal.	.15
Benzol, Pure	gal.	.75
Bismuth, Metallic	lb.	1.95
Bitumen, see Asphaltum.		
Blue-Vitriol, see Copper Sulphate.		
Borax, Crystals or Powdered	lb.	.10
Borax Glass	lb.	.35
Cadmium, Metallic	lb.	.70
Carbon Bisulphide	lb.	.10
Calcium Carbonate (Precipitated Chalk)	lb	.10
Chrome-Green	lb.	.50
Copper, Lake, (carload)	lb.	.13
Copper, Lake, (cask)	lb.	.13¼
Copper, Electrolytic, (carload)	lb.	.12⅞
Copper, Electrolytic, (cask)	lb.	.13⅛
Copper, Casting, (carload)	lb.	.12¾
Copper, Casting, (cask)	lb.	.13
Copper Acetate (Verdigris)	lb.	.35
Copper Carbonate, dry	lb.	.25
Copper Sulphate (Blue-Stone)	lb.	.09
Copperas, see Iron Sulphate.		
Corrosive Sublimate, see Mercury Bichloride.		
Cream-Tartar, see Potassium Bitartarate.		
Cryolite	lb.	.12
Cyanide, see Potassium Cyanide.		
Dextrin	lb.	.15
Emery Flour	lb.	.04
Emery, F F & F F F	lb.	.03
Flint, powdered	lb.	.01
Fluor-Spar	lb.	.01¼
Fusel-Oil	gal.	1.75
Gold Chloride	dwt.	.60
Gum Copal	lb.	.30
Gum Guiacum	lb.	.26
Gum Mastic	lb.	.70
Gum Sandarac	lb.	.35
Gum Shellac, brown	lb.	.50
Gum Shellac, white	lb.	.60
Iron Perchloride	lb.	.25
Iron Sulphate (Copperas)	lb.	.05
Lead Acetate (Sugar of Lead)	lb.	.15
Lead, Pig	lb.	.04½
Lead, Red	lb.	.12
Lead, Yellow Oxide (Litharge)	lb.	.12
Liver of Sulphur, see Potassium Sulphide.		
Manganese, Ferro, 80%	lb.	.10
Manganese, Metallic, pure	lb.	.75
Magnesium, Metallic	lb.	1.50
Mercury Bichloride (Corrosive Sublimate)	lb.	.93
Mercury, Metallic (Quicksilver)	lb.	.46
Mercury Nitrate	lb.	1.50
Mercury Oxide, yellow	lb.	1.80
Nickel and Ammonium Sulphate (Double Salts)	lb.	.16
Nickel Carbonate, dry	lb.	.60
Nickel Chloride	lb.	.50
Nickel Metallic	lb.	.47
Nickel Sulphate (Single Salts)	lb.	.25
Nitre (Saltpetre), see Potassium Nitrate.		
Oil of Vitriol, see Acid, Sulphuric.		
Paraffine	lb.	.15
Phosphorus, yellow	lb.	.40
Phosphorus, red	lb.	1.10
Pitch	lb.	.05
Plaster of Paris, Dental	bbl.	4.00
Platinum Chloride	oz.	20.00
Platinum Metallic	oz.	38.50
Potash-by-Alcohol, in sticks	lb.	.50
Potash, Caustic (Potassium Hydrate)	lb.	.08
Potassium Bichromate	lb.	.14
Potassium Bitartarate (Cream of Tartar)	lb.	.31
Potassium Carbonate (Pearlash)	lb.	.10
Potassium Chlorate	lb.	.15
Potassium Cyanide	lb.	.25
Potassium Iodide	lb.	2.25
Potassium Nitrate (Nitre or Saltpetre)	lb.	.10
Potassium Permanganate	lb.	.17
Potassium, Red Prussiate	lb.	.60
Potassium, Yellow Prussiate	lb.	.24
Potassium Sulphide (Liver of Sulphur)	lb.	.15
Potassium Sulphuret, see Potassium Sulphide.		
Potassium Sulphocyanate	lb.	.70
Pumice, Ground	lb.	.05
Quartz, Powdered	lb.	.01
Rosin, Yellow	lb.	.04
Sal-Ammoniac, see Ammonium Chloride.		
Sal-Soda, see Sodium Carbonate.		
Silver Chloride, dry	oz.	.75
Silver Cyanide	oz.	1.00
Silver, Fine	oz.	.53¾
Silver Nitrate, crystals	oz.	.50
Soda-Ash	lb.	.05
Sodium Biborate, see Borax.		
Sodium Bisulphite	lb.	.15
Sodium Carbonate (Sal-Soda), crystals	lb.	.02
Sodium Hydrate (Caustic Soda)	lb.	.05
Sodium Hydrate (Caustic Soda) by Alcohol (in sticks)	lb.	.45
Sodium Hyposulphite ("Hypo")	lb.	.04
Sodium Metallic	lb.	.90
Sodium Nitrate	lb.	.05
Sodium Phosphate	lb.	.09
Sodium Silicate (Water-Glass)	lb.	.04
Soot, Calcined	lb.	.15
Spelter, see Zinc.		
Sugar of Lead, see Lead Acetate.		
Sulphur (Brimstone) in lump	lb.	.05
Tin Chloride	lb.	.43
Tin, Metallic	lb.	.36⅞
Turpentine, Venice	lb.	.35
Verdigris, see Copper Acetate.		
Water, Distilled	gal.	.15
Water-Glass, see Sodium Silicate.		
Wax, Beeswax, yellow	lb.	.45
Wax, Carnauba	lb.	.70
Whiting (Ground Chalk)	lb.	.02
Zinc Carbonate, dry	lb.	.19
Zinc Chloride	lb.	,12
Zinc, Sulphate	lb.	.06
Zinc, (spelter)	lb.	.05⅞

THE

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AND

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The Slow Melting of Aluminum.

We are convinced that the majority of aluminum founders melt their aluminum too rapidly. Aluminum melts at such a comparatively low temperature that there is always a tendency to allow the melting to take place rapidly, and with the result that portions of the metal are overheated or burned before the remainder has become liquid. The final temperature, when all the aluminum has melted, may not be too high, but nevertheless the overheating of a portion of the metal has resulted in injury.

All metals are injured by overheating, and aluminum is affected by such treatment more than brass or bronze. The metal is oxidized and gas is absorbed so that when castings are made, pin-holes, blow-holes and weakness result. The best method of melting aluminum is to allow it to take place gradually so that no portion is melted long before the rest has begun to heat. This can be readily accomplished by reducing the heat of the furnace, no matter what fuel is used.

We have seen aluminum put into a crucible in an oil furnace and the full blast turned on so that in from 5 to 10 minutes the whole charge was melted. This is bad practice. No matter what kind of furnace is used, the heat can always be regulated so that the melting of the aluminum will take place gradually and no portion will be overheated.

If foundrymen have blow-holes in their castings and they are lacking in strength, then

look to the melting proposition. It will usually be found that it is the cause of the difficulty. We are fully convinced that too high a heat is used in the majority of foundries in which aluminum is melted and it is evidenced by the fact that the melting takes place too rapidly. Slow melting usually means better metal in all cases, provided, of course, it is not unduly prolonged. The ideal condition, although one rarely obtained in practice, is when all of the aluminum (and this feature applies to other metals as well) begins to melt at the same time.

Sodium Cyanide in Plating.

As sodium compounds are always cheaper than those of potassium, they are used where ever possible. It has always been a matter of astonishment that sodium cyanide was not used in the plating trade, but it is easily explained by the fact that radical changes can not be made in manufacturing operations. In the early history of plating, cyanide was made from the yellow prussiate of potassium, and this in turn was made from carbonate of potassium, resulting from the leaching of wood ashes. Unless there is some good reason, either in the matter of cost, or in quality improvement, manufacturers rightly refuse to change their methods, and this has been true in the case of cyanide.

In the plating trade, potassium cyanide, free from sodium cyanide, was used for many years, and it was made exclusively from the yellow prussiate. The advent of processes for producing cheap metallic sodium, however, changed the cyanide industry so that for quite some time, a double potassium and sodium cyanide has been manufactured and extensively used. Up to the present time this double cyanide has been more extensively used than any other kind.

While sodium cyanide is not a new product, it is only within a year or two that it has been used to any extent. The largest consumers of cyanide are mining companies that work the cyanide process for obtaining gold from gold ores. They early appreciated that sodium cyanide is more economical than potassium cyanide.

As far as the use of sodium cyanide in the plating trade is concerned, it has not been extensively employed. It has been tried out thoroughly, however, and a few concerns are using it with good results. As far as can be ascertained it works equally as well as potassium cyanide, and has one property not possessed by it. It does not cause the difficulty of "spotting-out" of plated work to nearly as great a degree. This is explained by the fact that, while potassium cyanide is deliquescent (i. e. it has the property of absorbing moisture from the air and becoming liquid), sodium cyanide is not, and has the property of "drying-out." When the plating solution made of sodium cyanide oozes out from the pores of a casting, therefore, it will soon dry and not remain liquid and spread over a larger area as potassium cyanide will do.

Variation in Composition of Monel-Metal.

Monel-metal is a so-called "natural" alloy. In other words it is made from copper and nickel ores and no attempt is made to separate the two metals. The high cost of commercial nickel is caused by the expense of separating it from the copper, and by allowing the two metals to remain together in the smelting and refining operations, the cost is greatly reduced so that Monel-metal is sold at a price that makes it very attractive.

There have been various mixtures given as the composition of Monel-metal, but they have been found to differ quite widely. Recently the Government made some tests of the metal and an analysis was made of each sample. The samples were rolled, drawn and cast metal. The following results were obtained:

	Copper	*Nickel*	*Iron*
4 Cast Bars	24.76%	70.50%	5.24%
2 Rolled Bars	25.86%	72.10%	2.04%
2 Drawn Bars	26.52%	72.60%	0.88%
1 Rolled Bar	25.70%	73.90%	0.40%

The wide variation in the iron contents is worthy of note, but such differences are to be expected when the method of making the metal is taken into consideration.

An alloy of aluminum, recently been patented in France contains the following: 94.30% of aluminum; 4.60% of copper; 0.33% of nickel; 0.33% cobalt; 0.33% of manganese; and 0.10% of magnesium. It is claimed to be quite strong and light.

The Bradley Rust-Proof Black Finish for Iron and Steel and the Method of Producing it.

From the first use of iron or steel, the rust-proofing problem has always been given an exceptionally large amount of attention. It was soon appreciated that some coating is necessary to preserve it from the attacks of the elements and many processes have been applied with more or less uncertain results. Paints, lacquers and varnishes are, of course, extensively used, as there are instances where other methods cannot be employed. Galvanizing and tinning are good as far as they go, but for many purposes they cannot be employed; and, too, they do not produce a same time has a color that will adapt it for ornamental purposes whenever desired.

A black finish has always been the one most coveted and various processes are known for producing it. One of the earliest was the so-called "Bower-Barff" process invented by George and Anthony S. Bower and Frederick S. Barff. This process was patented in England in 1876 and also in the United States and was the beginning of the so-called Bower-Barff method. In 1880 an improvement was made by George and Anthony S. Bower. The process consisted in heating the iron or steel

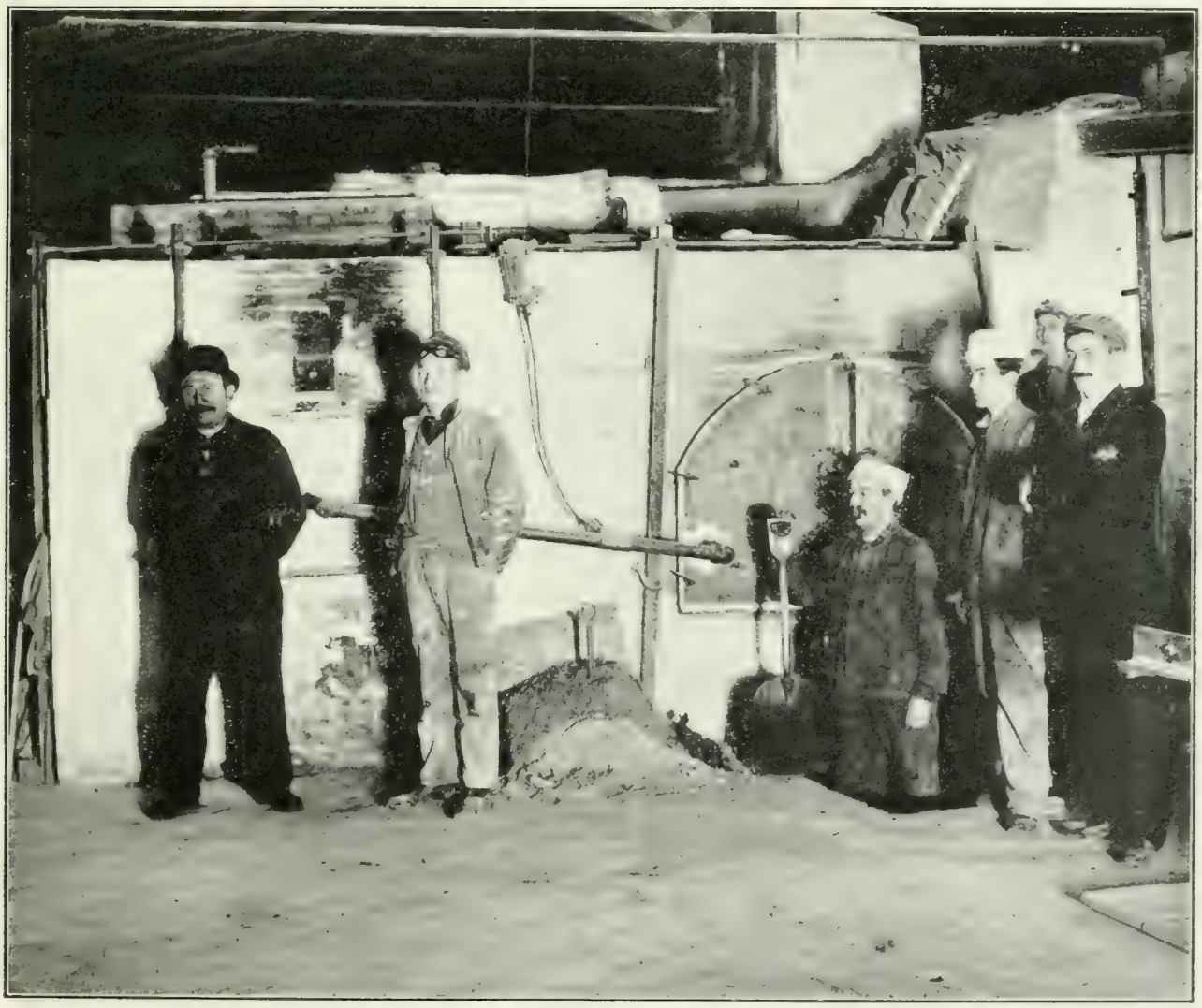


Fig. 1. Front of the Furnace Used for the Treatment of the Iron or Steel at the Works of the Bradley Rust-Proofing Co.

pleasing finish. Electroplating is extensively carried on, but this is also open to the objection that such a protection is quite limited on account of the necessarily thin deposit. What has always been desired is a rust-proof finish, that is so both in name and reality, and at the articles in an atmosphere of steam. The operation was done in a muffle heated to a red heat and steam passed in for several hours. The surface under such a condition is oxidised, and a coating of the magnetic oxide of iron (black oxide of iron) is formed.

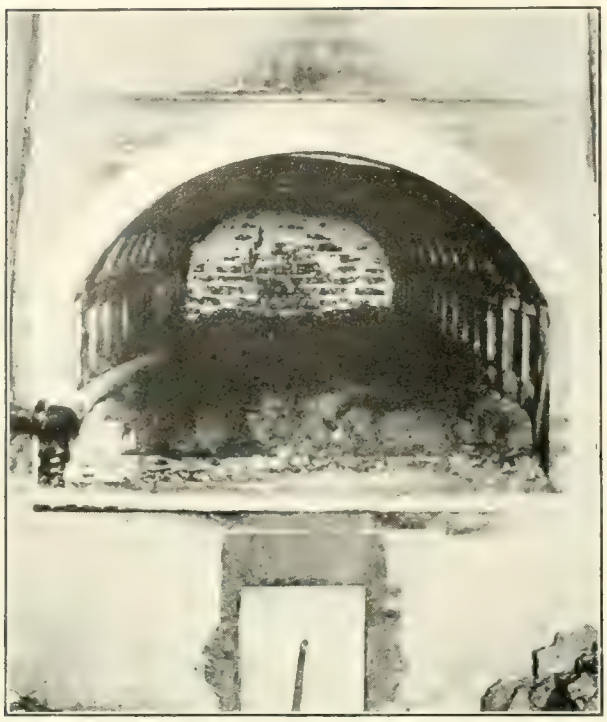


Fig. 2. Interior of the Muffle.

It was found that while a black oxide could be obtained, it was difficult to carry out uniformly in practice and the red oxide frequently made its appearance. This was such an obstacle that in 1888 George W. Gesner of Brooklyn, N. Y., succeeded in modifying the process so that much better results were obtained. It is worthy of note that John J. Bradley the inventor of the process herein described, worked with Prof. Gesner while he was experimenting upon the subject.

The Gesner modification consisted in allowing a small quantity of naptha to pass into the red hot muffle along with the steam. In this manner the formation of the red oxide was reduced. The process proved more or less successful and it may be said that the majority of plants started to produce the Bower-Barff finish in the United States used the Gesner modification. While the Gesner process was a great improvement upon the original Bower-Barff method, it was still open to the objection of the red oxide. This proved to be such an obstacle that the term "red plague" has been applied to the red oxide. This feature retarded the use of the finish to such an extent that it seemed, at one time, as though the process were doomed. Uniformity

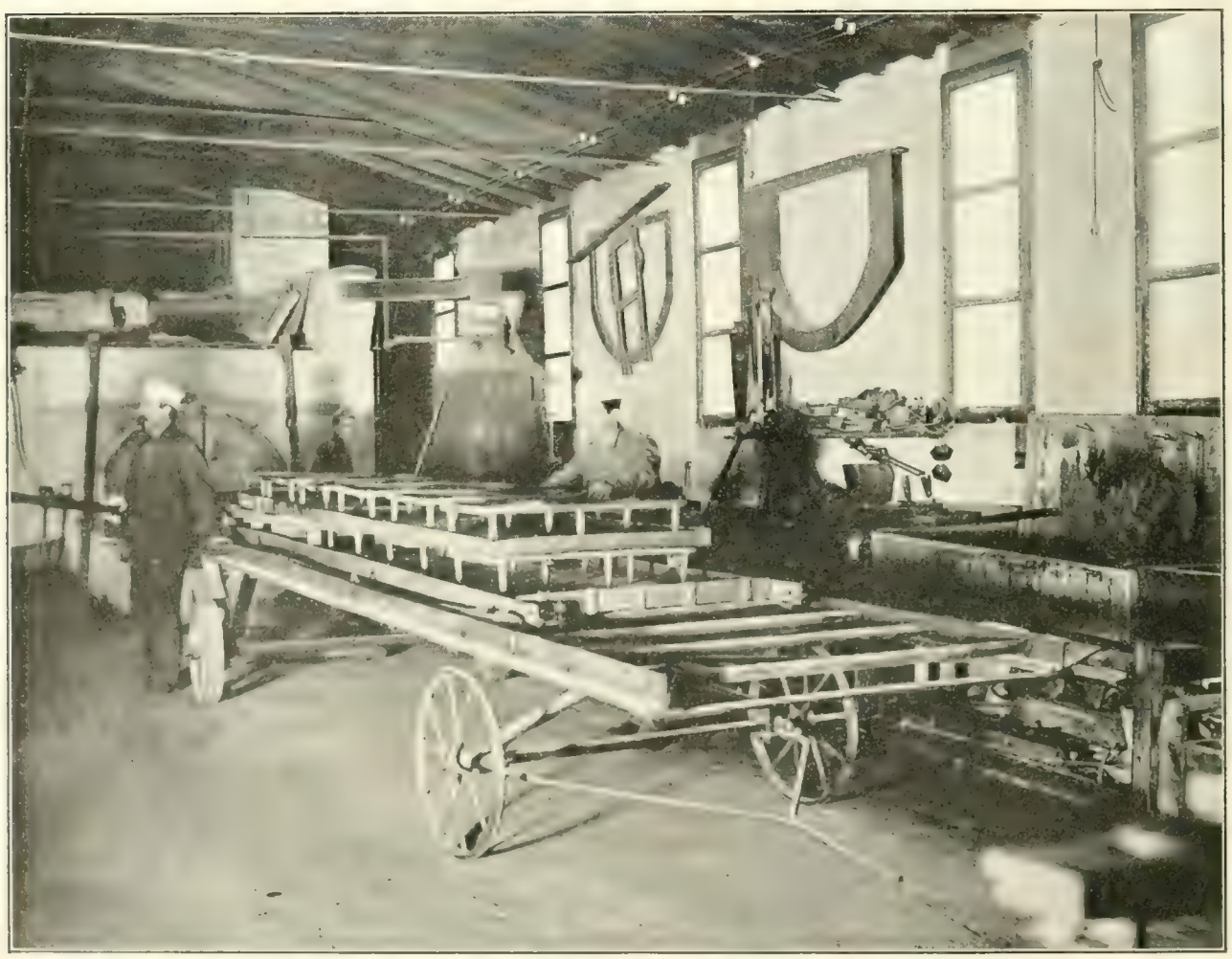


Fig 3. Wagon and Racks Used for Charging the Furnace.

in the production of the finish was difficult to obtain.

John J. Bradley of Brooklyn, N. Y., who, as previously stated, worked with Prof. Gesner while evolving his process, found that the Gesner process could be greatly improved so that the red oxide would not make its appearance and a more durable and uniform coating could be obtained. The improved process, as worked out by Mr. Bradley, is embodied in his patent specification issued in 1908. The method which he carries out is as follows:

The articles are heated to a red heat in a muffle and hydrogen gas passed in. A small amount of gasoline is also allowed to pass in with the steam so as to improve the color of the coating. After an hour or so the articles are removed, cooled and given a thin coating of oil to produce an even color. The oil is not imperative, but deepens the shade and improves the surface for ornamental purposes.

Fig. 4. Articles After Sand-Blasting Previous to the Heat Treatment.

The process is now being carried on commercially at the works of the Bradley Rust-Proofing Co., 35 Ferris St., Brooklyn, N. Y., in which the illustrations herewith shown were taken. In Fig. 1 the front of the furnace is

Fig. 5. Assortment of Iron and Steel Articles After Having Been Rust-Proofed.

shown. It consists of the ordinary shaped muffle furnace and the heating is done by coke. The muffle itself, in which the articles to be treated are placed, is shown in Fig. 2. It is about 20 feet long and on each side ports enter for allowing the admission of the heat. On one side, as may be seen in Fig. 2, an iron pipe carries the hydrogen gas.

The articles to be treated are first preferably sand blasted to clean them. While any other method, such as pickling or tumbling may be employed, the sand blast has been found more rapid and efficacious. Not only is the surface quickly cleaned, but it is left in an ideal condition for receiving the finish. Some articles that have been sand-blasted and are ready for the application of the finish are shown in Fig. 4.

The articles, after being sand blasted, are placed on a carriage shown in Fig. 3 so that they will become heated evenly, and then placed in the muffle. The mouth of the muffle is next sealed and the heating carried on.

The method of generating the hydrogen gas is by passing steam over red hot iron turnings. The steam is generated in a boiler at the side of the furnace. The hydrogen gas is allowed to pass in during the heating which is continued for an hour or so, depending upon the depth of the coating desired. The articles are then removed and allowed to cool, after which they are given a film of linseed oil. A variety of such articles are shown in Fig. 5.

The coating thus produced is a dead black and quite hard so that it is not easily abraded. The uniform black color, free from any indication of red oxide, is at once apparent to those who see the process in operation.

Cast-iron, steel or malleable iron may be treated with equal results and in Fig. 5 an assortment of such articles may be seen. The tests that have been upon the goods show that the atmosphere has little effect upon it and the finish will resist the action for many years with the preservation of the color. Tests of the finish in 20 per cent sulphuric acid have also shown that very little action has taken place even after several months.

The applications of the finish are many. The assortment of articles in Fig. 5 indicates the extensive field. As it is both an ornamental and rust-proof finish, the future will undoubtedly find it extensively employed.

The Commercial Use of High Pressure Gas in Melting.

Some time ago the Birmingham Municipal Gas Department laid mains within a limited area in the centre of Birmingham with a view of supplying gas under pressure for manufacturing purposes. The Birmingham Aluminum Casting Co., (Ltd.) of Cambridge Street, Birmingham, is the first manufacturing concern in Birmingham to adopt the system, and on October 24 the company invited a number of people interested in the matter to witness a demonstration. The plant used for the purpose was of the simplest description, consisting merely of a fire-clay enclosure, 3½ in. in thickness, to which the gas was conveyed through specially laid high-pressure pipes Common nozzles were used for burners, and it was explained that nothing more was necessary. Provided the air apertures were properly adjusted at the outset no further attention would be required until the operation was finished. About a hundredweight of aluminum was put into a crucible in the centre of the muffle and the gas ignited, and in about an hour the metal was poured, and made what appeared to be a sound casting. We understand that the volume of gas consumed in the experiment cost 1*s.* 4*d.*, and that that amount would compare favourably with the cost of melting a similar quantity of metal with coke. The new method of heating is more cleanly and less troublesome than the coke method; it is also quicker; while it has the further advantage of costing little or nothing to instal.—*The Ironmonger.*

New Process for Making Cyanide.

According to Consul J. I. Brittain of Prague, Austria, a large plant has been constructed in that city for the manufacture of cyanide from the thick molasses, a by-product resulting from the manufacture of beet sugar. There is already a similar factory in operation in Kolin near Prague and two in Germany are now using a similar process.

The molasses is first used for making alcohol by fermentation and the residuum is employed for making the cyanide. It is stated that the output of the Kolin factory is about 240,000 lbs. per month, and is sold to the gold mining companies in South Africa.

Notes on the Close-Plating of Automobile Levers.

By George M. Cawthorne.

In The Brass World, Sept. 1910, I read with interest the article on page 306 about the expense of close plating automobile parts. It states that close plated articles of this kind are more expensive than solid brass.

Having been a close plater for 19 years I will say that there are automobile parts which I can close plate as cheaply as a heavy brass electrodeposit can be put on. The difficulty is

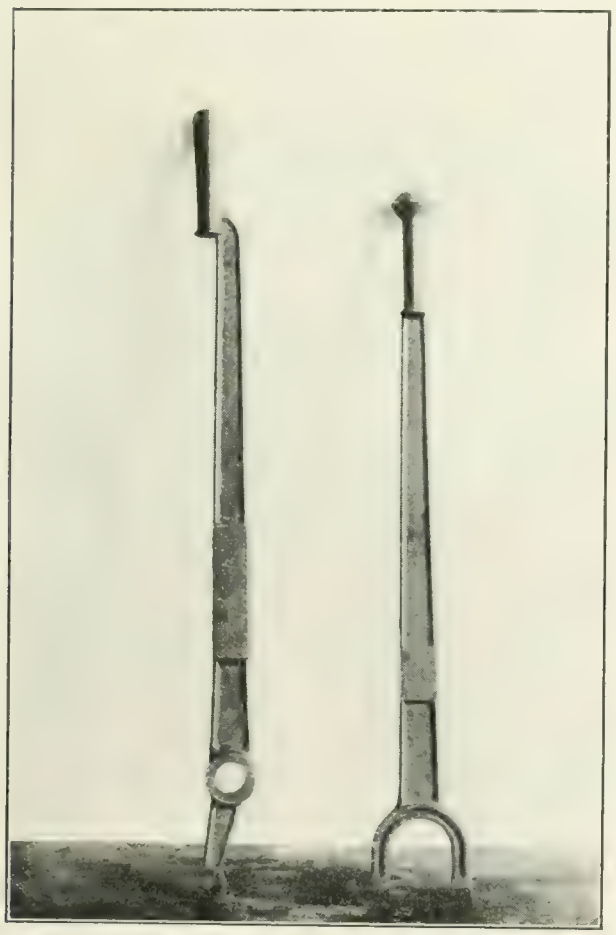


Fig. 1. Steel Automobile Levers Showing Bad Shape for Close-Plating.

that automobile manufacturers do not take into consideration the fact that the parts could be close plated cheaply if slight changes were made.

Take, for example, the levers shown in Fig. 1. These are made of steel forgings and with a bead around the edge. This bead is the cause of the difficulty. In order to close plate a lever of this kind, it is necessary to remove the scale and polish on a wheel so that a smooth surface will be obtained. Over this smooth surface sheet brass is soldered and ironed down smoothly so that the hard, durable sheet brass surface is obtained. For a good wearing surface, one that is close plated cannot be equalled.

If manufacturers would make the levers without the bead so that the polishing could be rapidly done and likewise leave a slightly rounding or concave surface so that the sheet brass could be readily ironed down, the close plating would not be expensive.

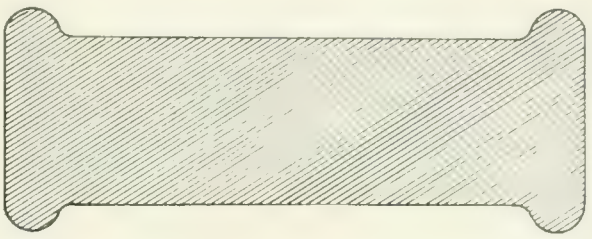


Fig. 2. Cross Section of Lever Shown in Fig. 1.

In order to illustrate this matter, reference should be had to Figs. 2 and 3. In Fig. 2 the shape of the lever, in cross section, shown in Fig. 1 is illustrated. The difficulty of polishing the surface will at once be appreciated and close plating would be greatly reduced in the cost so that it could be done at a price that

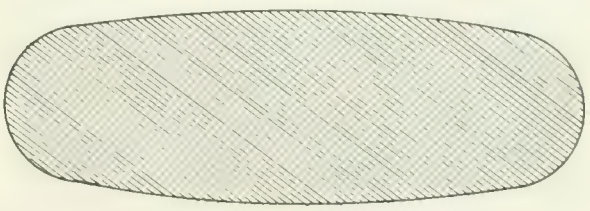


Fig. 3. Cross-Section of Lever that Could be Brass Close-Plated as Cheaply as Electroplated.

would rival that of electroplating and with none of its disadvantages. If made in this manner I could close-plate a pair of levers in from 1 to 1½ hours. As now made, it takes twice as long.

The presence of copper in silver plating solutions is not injurious unless in large amount. It has been found that at the current density employed in ordinary silver plating, that the copper does not deposit.

Metallic zinc behaves in alkali solutions in a manner similar to that of aluminum although it is not attacked as readily. The surface of zinc, however, it atacked by alkalies and in cleaning it for plating care must be taken not to allow it to remain in the cleaning solution too long in case strong alkalies are employed in the cleaning solution.

Briquetting of Brass and Bronze Chips in Germany.

According to U. S. Consul-General A. M. Thackara of Berlin, Germany the briquetting of metal chips in Germany is now carried on to a considerable extent. In the *Daily Consular Report,* the following information is given:

The process of a certain company is that of the Ronay system, which is patented in all civilized countries. It is used in about 10 foundries and machine factories in Germany and by several firms in Austria and England. The principal use to which this system has been put is the briquetting of iron ores and the metal wastes of foundries and machine shops.

The owners of the process claim that it can also be profitably employed in briquetting coal and peat, furnace soot, charcoal dust, and sawdust for fuel purposes, in briquetting bronze, copper, and brass scrap to be remelted, and in briquetting salt, rice, corn, and other kinds of meal and bran for stock feed when compact form is desired. The high-pressure briquetting company referred to has the sale or disposal of all licenses or royalties for briquetting iron and metal waste, and another company the licenses and royalties for other briquetting purposes.

The briquetting plant consists of a simple hydraulic press of massive construction. The briquet molds are of various sizes and may be either round or rectangular in shape. The material is weighed and placed in molds automatically, and after being briquetted is removed automatically. No binder of any kind is used, the secret of the process being to apply a very high pressure in such a manner as to insure a uniform consistency in every part of the briquet and to expel all air from the material forming the briquet. If the air is not completely expelled or if homogeneity is not obtained, the briquets are apt to disintegrate before fusion when placed in the furnace.

In briquetting iron and steel waste the object is to obtain a more economical utilization than is possible by the ordinary methods. When the waste which has not been briquetted is to be remelted, a large part is blown out of the furnace owing to the comparatively greater surface exposed in proportion to the weight, and for the same reason the nonbriquetted metal will not stand the high temperature necessary for fusion without being burned, and besides, combinations with sulphur are greater than when the waste is briquetted, thus lowering the quality of the iron obtained.

Most of the firms using the process in Germany are large manufacturers of machinery, who briquet their own steel and iron waste and afterwards use it in connection with various qualities of pig iron to make metal for casting purposes. The process has been successful both as to economy and as to the quality of the products obtained.

A firm at Tegel, near Berlin, in making castings for locomotive cylinders and other high grade castings, formerly used mixtures of various kinds of pig and scrap iron costing $20 to $22.40 per ton. Mixtures of cheaper pig and scrap iron with 20 per cent cast-iron briquets and 10 per cent steel briquets are now used at a cost of $14.75 to $15.50 per ton. Thus the firm profits annually by $7,000 on cylinder iron alone.

A Chemnitz metal works make a business of briquetting metal turnings and other metal waste for machine factories and foundries in that section. The shop wastes are shipped to the briquetting plant and returned in the form of briquets. The rates charged per ton range from $4.75 to $6 for cast-iron turnings, $6 to $7.15 for steel, and $12 to $16.50 for bronze, copper, and brass turnings. According to information furnished by the inventor of the process, the total running expense, not including the cost of the royalty or license, for a plant having an annual capacity of 10,000 to 15,000 tons would amount to about $1.20 per ton of briquets.

The use of brass chips, without any heavy brass, for making castings is bad practice as it causes excessive oxidation and gas absorption with the formation of pin-holes and dross in the castings.

According to Consul Isaac A. Manning of La Guaira, Venezuela, the quality of American plated goods received in that country is very poor. Samples were submitted and claimed to be high class goods. When the shipment was received, the goods were found badly shaped, roughly finished, and the electroplate so thin that oxidation began at once and the deposit of silver commenced to wear off.

Uses Which the Government Makes of the Non-Ferrous Metals Purchased.

In The Brass World, Nov. 1910., the various mixtures employed by the U. S. Navy Department and the specifications for them, were enumerated. It may be of interest to our readers to know for what purpose the various metals and metal mixtures are employed. In a general way they are used for the following purposes:

Commercial Brass Castings. Name and number plates; cases for instruments; oil cups and distributing boxes.

Copper. Copper pipe and tubing.

Gun Bronze. All composition valves 4 in. in diameter and over; expansion joints flanged pipe fittings; gear-wheels; bolts and nuts; miscellaneous brass castings; all parts where strength is required of brass castings or where subjected to salt-water, and for all purposes where no other alloy is specified.

Safety valves, relief valves, feed check and stop, surface blow, drain, air and water cocks, main stop, throttle, reducing, sea, safety sluice, and manifolds at pumps.

Condenser, distiller and feed-water heater heads, shapes, and salt water chests. Oil cooler. Air-pump casing, valve seats, buckets, main circulating pumps, water cylinders, valve boxes, water pistons, stuffing boxes, followers, glands. In general all the water end of pumps.

Stuffing boxes, glands and bushings for iron and steel boxes. Bearing boxes in blowers. Distance pieces in journal boxes. Grease extractors, steam strainers; separators, casing for stern tube and propeller shafts; propeller hub caps.

Main, stern tube, strut and spring bearings. Intermediate and low pressure relief valves and casings; cross-head brasses, crank-pin brasses, eccentric straps and distance pieces.

Brazing-Metal. All flanges and fittings that are to be brazed.

Journal Bronze. Journal boxes, guide gibs, bushings, sleeves, slippers etc.

Valve Bronze. All valves below 4 inches in diameter, for steam and general purposes, for which the material is not otherwise specified. Hose couplings and fittings.

Manganese Bronze. Propeller hubs, blades, engine framing, and castings requiring great strength.

Monel Metal. Same use as manganese bronze and for pump liners, valve seats and castings requiring great strength, hardness and incorrodibility. Shaft nuts and caps.

Cast Naval Brass. Valve handwheels, handrail fittings, ornamental and miscellaneous castings, and valves in water chests and condensers.

Phosphor-Bronze. Castings where strength and incorrodibility are required. Pump rods and valve stems, springs etc. exposed to salt-water.

Screw Pipe Fittings. For composition screwed fittings.

Nickel. For valve seats.

Admirality Metal. Condenser distiller, feed water heater and evaporator tubing.

Bendict Nickel. Same use as Admirality Metal.

Muntz Metal. Bolts and nuts not subject to the action of salt water.

Rolled Manganese-Bronze. Round rods, used principally for propeller blade bolts, air pump and condenser bolts, and parts requiring strength and incorrodibility.

Rolled Monel-Metal. Rolled rods, used principally for propeller blade bolts, air pump and condenser bolts, and parts requiring strength and incorrodibility. Pump rods.

Rolled Naval Brass. Rolled rods, used principally for propeller blade bolts, air pump condenser bolts, and parts requiring strength and incorrodibility. Pump rods, tube sheets, and supporting plates, and shaft for valves in water heads for condensers.

Commercial Rolled Brass. For linings, trimmings, etc. Brass pipe for hand rails and boiler dry pipe. Distributing oil and water pipes. Brass rods for trimmings and purposes where strength and incorrodibility are not required.

Anti-Friction Metal. Lining bearings.

(The extensive use of "Gun-Bronze" is worthy of note. This is the well known 88-10-2 mixture and is employed more extensively than any other non-ferrous alloy for making the sand castings. It is a very satisfactory mixture.—*Editor.*

Sulphur in brass and other copper alloys can be removed by the addition of a small quantity of manganese, as it has more affinity for sulphur than any other metal.

The Production of a Heavy Brass Deposit.

By Alfred Bidet.

The article in THE BRASS WORLD, Sept. 1910. page 306 on "The Brass Plating of Automobile Parts" has interested me. In this connection I wish to say that I have had occasion to deposit a heavy brass coating upon the valves of brass band instruments. These valves are of German-silver and were worn loose by long service. The rough coating matters little as we have to grind the valves afterwards. I deposit brass to a thickness of 1/16 or ⅛ in., and which is soft and ductile.

If platers would use the double cyanides of copper and zinc instead of the carbonates in their solution, they would be more successful. The brass solution which I use for the production of heavy brass deposits is made of the cyanides. A slight amount of free cyanide is used, of course, to keep the anodes clean. A very large anode surface is employed. The current is cut down by the rheostat so that only a slight amount of gas is given off from the work being plated. Only in one-half hour can a good deposit having a fine matt surface be obtained.

No arsenic or other brightener is used. The solution stands about 10° Beaume' and is used at a temperature of from 150° to 200° F. A heavy deposit can be obtained in about 6 hours. By running the deposit through a bright dip, a surface quite suitable as a base for gilding is obtained.

A Cerium-Mercury Pyrophoric Alloy.

According to a French inventor, the alloys of cerium and mercury make excellent pyrophoric alloys. From 40 to 80 per-cent of cerium is claimed and such alloys have been patented in France by him.

It is claimed that the alloys when struck, emit sparks which give an exceedingly brilliant light. The intensity of the sparks decrease when the quantity of cerium is over 80 per-cent. The presence of other rare metals of the cerium group, such as lanthanum and didymium, do not interfere.

The alloys are made by heating finely divided cerium to about 600 degrees C. with mercury in a closed vessel. They are brittle and may be readily powdered.

Soft Solders Melting at Guaranteed Temperatures.

The custom seems to have sprung up in England of making solders to melt at guaranteed temperatures and at least one firm of solder manufacturers in that country is now advertising that they are prepared to supply such solder under a temperature guarantee.

This practice does not appear to have become prevalent in the United States and we can see no particular advantage in it other than it enables a solder manufacturer to avoid the rigid requirements of chemical analysis. In our own country, solder is supplied upon chemical analysis and the maker guarantees the mixture only. For example he will guarantee his solder to be "half and half" or "two and one," but not the melting point.

The English maker, by guaranteeing the melting point of his solder, side-steps the chemical analysis problem, and he is at liberty to make his solder of what mixture he chooses. Scrap metals and impurities have no bearing on the question. Antimony, copper or zinc may be present in small quantities without affecting the melting point appreciably, but they will strongly affect the running or adhering qualities of the solder and for this reason, we are unable to believe that the practice has any great commercial value. There is so little difference in the melting points of the *good* soft solders that in ordinary cases the same results will be obtained what ever the mixture as long as it contains a reasonable quantity of tin. In the majority of instances no difference could be detected in the results obtained with a half and half solder and a two and one mixture. We are sure that the freedom of the solder from impurities, such as zinc, antimony and copper, as well as oxides, is of far more importance than the actual melting point as the flowing properties are of more value than a slight lowering of the melting point.

Brazing brass is a variety containing as small a quantity of zinc as possible and yet have the yellow color. The object is to render it of a much higher melting point than that of the brazing solder. Brazed brass tubing is, for example, made of about 72% of copper and 28% zinc, while the solder used for brazing it contains equal parts of copper and zinc. Ordinary high brass contains too much zinc to allow brazing as its melting point is too near that of the brazing solder.

The Effect of Dies on the Season-Cracking of Drawn Brass.

It is not an uncommon thing to find drawn brass that is season cracked. If a scrap pile of old brass is examined in a junk dealer's shop, it will usually be found. The cracks, as a usual thing, will be found upon drawn brass. Such cracks do not make their appearance at once, but after several months or more. In Fig. 1 is shown a drawn brass lantern base that season cracked after about eight months.

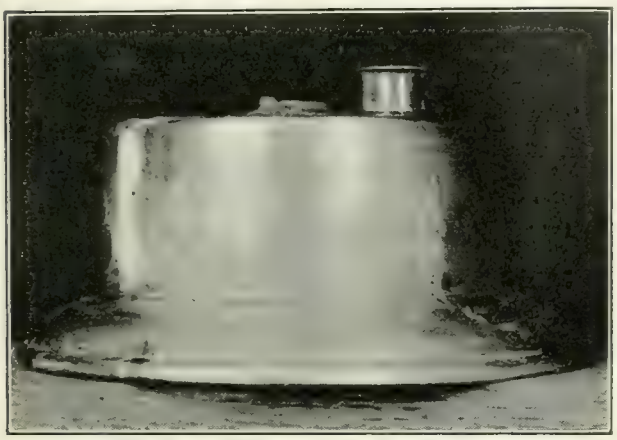


Fig. 1. Drawn Brass Lantern Base which Season Cracked.

The season-cracking of drawn brass, as a usual thing, is caused by the use of a punch and die that do not give the sheet brass the right degree of stretching. In order to prevent it, the brass should be smoothed out well in the drawing operation so that the metal is actually stretched and worked. It should not be simply formed into shape.

The difference between actually stretching and working the metal during the drawing operation in the press, and the forming into shape may be appreciated by reference to Figs. 2 and 3. In Fig. 2 is shown a drawn brass shell in which the punch and die were made in the desired manner. The metal was stretched during the drawing. In Fig. 3 is shown another shell in which the punch and die simply formed it. This can usually be ascertained by the appearance of slight wrinkles on the surface. When they appear, the brass is apt to season-crack.

The season-cracking is frequently perplexing because only a small proportion of a certain lot of drawn shells will crack. This is usually explained by the fact that the sheet brass, from which the shells were made, varied to some extent in gauge. The sheet that was "full" drew so that the metal was worked or stretched to a considerable extent. The sheet that was light was only formed.

The reason why such drawn shells season-crack when the metal is not fully stretched

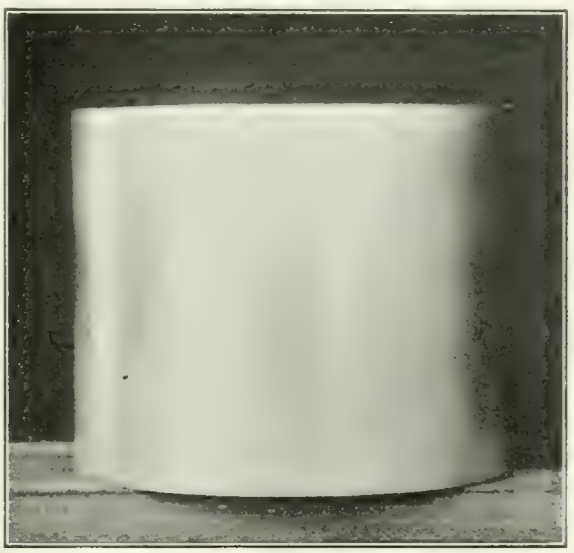


Fig. 2. Shell Showing Smooth Drawn Surface from Right Shaped Die and Punch.

or worked, is that there is a constant tendency to pull the metal apart. When the brass is stretched, as it is in the right kind of press work, the strains are uniform. The formation of the strains in the poorly drawn shells, is

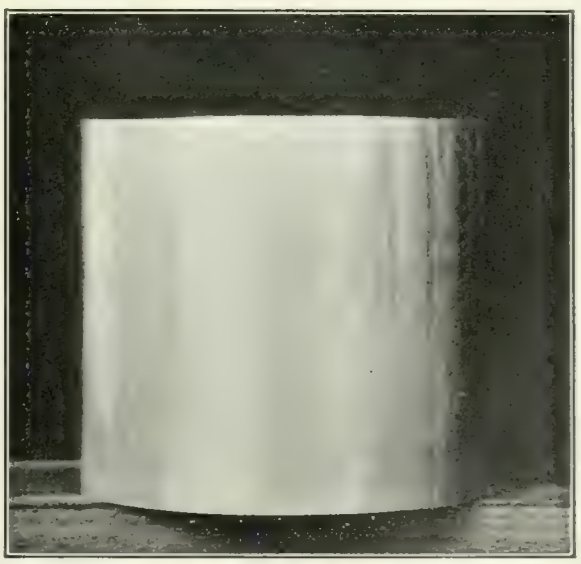


Fig. 3. Shell Showing Badly Shaped Punch and Die Which Drew it.

increased by the use of brass that is too hard, either by rolling, or by the use of too hard a mixture. The use of too hard a mixture, is now a common fault as it is cheaper. In drawing shells from such hard brass, the metal is fatigued.

To prevent the season cracking of such drawn shells, therefore, the use of a punch and die that will stretch the metal should be employed; and at the same time a comparatively soft brass must be used. As a usual thing, a straight 2 and 1 mixture is satisfactory and is extensively used for the best class of drawn work.

Edison's Method of Producing Soft Nickel Deposits.

In the manufacture of the Edison storage battery, as described in THE BRASS WORLD, November, 1910., the can or container in which the solution is held, is made of sheet steel nickel plated. One of the first things done in the manufacture of this battery was to devise a method suitable for nickel plating the steel container. After much experimenting the following method was adopted. The process was patented by Edison in 1903:

The steel cans are first coated with nickel in the usual manner. The deposit put on is thin and the regular nickel plating solution is used. The cans thus coated with nickel are then placed in a muffle furnace and heated to a yellow heat. The muffle is closed and hydrogen gas is allowed to pass in while the heating is going on. The muffle is then cooled down while hydrogen gas is passing in.

The nickel deposit thus treated is greatly changed in character. Instead of being hard and more or less brittle, as all electrodeposited nickel is, it is not only softened but adheres to the steel tenaciously. In other words, the nickel is actually welded to the steel. In connection with the character of the nickel coating so formed, Edison says: "The weld between the nickel and the steel is so perfect that sheets plated in this way can be formed into various articles by the drawing or stamping process without cracking or flaking of the film, which is not the case when the film has not been subjected to the welding process. In fact, I find that no matter how carefully the sheets of steel may be electroplated with nickel, any attempt to draw or stamp articles from them results in the cracking or flaking of the nickel coating, owing to the condition of tension of the latter. This condition is relieved by the welding process. This process also serves to anneal the sheets for the first operation of drawing."

The action of the hydrogen gas in the heating operation is to act as a reducing or non-oxidizing atmosphere. Neither the iron nor the nickel are oxidised when heated in hydrogen gas; in fact, any oxide present is reduced. The brittleness of electrodeposited nickel is caused by the occlusion or absorption of hydrogen gas in the plating solution, and when heated this gas is expelled leaving pure and soft nickel. While it would naturally seem that the nickel would absorb hydrogen gas again upon cooling, it does not. While the hydrogen gas would be expelled from the nickel were it heated in the air, oxidation would then follow and ruin it.

Use of Zinc in Sterling Silver Manufacture.

According to J. H. W. Rolason of Birmingham, England, zinc is preferable to copper as the alloying material in the manufacture of sterling-silver. He claims that the sterling silver thus made is much softer and more ductile than ordinary sterling-silver made with copper and casts sounder.

The proportions used are as follows:

Silver	975 parts
Zinc	25 parts

As far as the law is concerned, both in our own and in foreign countries, there is no restriction upon the kind of alloy that shall be used. All that is required is that the sterling-silver shall be 925 parts per 1000 fine.

Zinc, of course, has strong deoxidizing properties, and it has been used as an addition (in small quantities) to sterling-silver to deoxidize it. Sterling containing considerable zinc, however, has the property of being more drossy when melted than when copper is used. In addition to this point, it is a volatile metal and more difficulty would be experienced in maintaining the desired fineness than when copper is employed as the alloy.

According to a recent French patent in the name of J. M. Belin, a good aluminum solder may be made by first making a fusible alloy (which will melt in boiling water) of 3 parts of tin, 8 parts of bismuth and 5 parts of lead. The solder itself is then made by taking 10 parts of the fusible alloy, 300 parts of zinc and 5 parts of aluminum. This makes a strong solder. A softer one is made by taking 160 parts of the fusible alloy, 80 parts of zinc, 25 parts of aluminum and 80 parts of tin.

New Form of Cover for Use on Oil Furnaces Melting Gold or Silver.

In the melting of gold and silver, there is a constant loss by volatilization. This loss is always greater when a strong current of air plays about the crucible in which the melting is done. With gold, the loss is less than that of silver on account of its higher melting point, but in either case there is considerable volatilization. That this is true is

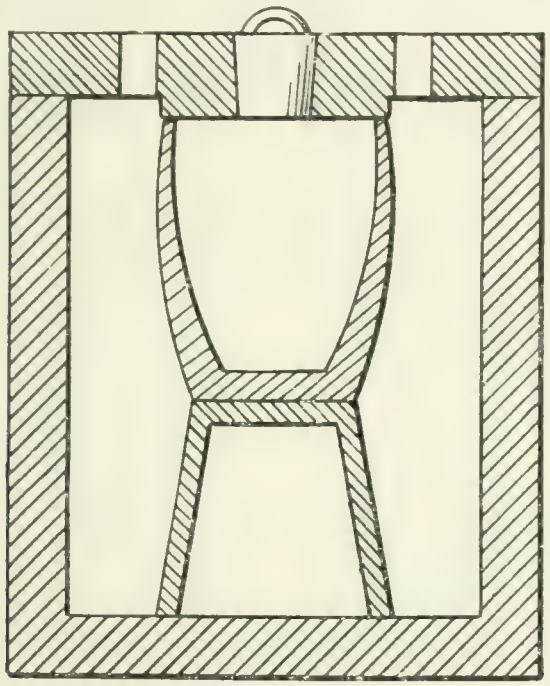


Fig 1. Cross-Section of Brown's Furnace for Melting Silver.

evidenced by the fact that the ceiling and other portions of the room in which the melting of silver is carried on will always be found covered with a fine deposit of metallic silver. While such adhering material can be saved, that which passes off in the air is lost. This loss is quite an item with a concern melting considerable silver.

In order to reduce this loss of silver by volatilization, J. L. R. Brown of Handy & Harman, Bridgeport, Conn., has invented and patented a furnace cover (U. S. Patent, 975,506, Nov. 15, 1910) which has proved quite satisfactory. The feature of the cover lies in the use of a number of small holes in it as shown in Fig. 2, through which the waste gases of the furnace pass. The cover fits down upon the crucible so as to prevent the blast from coming in contact with the silver. This may be understood by referring to Fig. 1.

As previously mentioned, the feature of the cover lies in the use of the small holes through which the waste heat passes so that it does not impinge upon the silver in the crucible as follows when it escapes through a central opening in the top of the cover. The blast, in other words, does not pass over the top of the crucible. Although there is, of course, some loss of silver in the melting, it is greatly reduced by the use of the cover.

The cover is intended for use with oil or gas furnaces in which a blast is used for

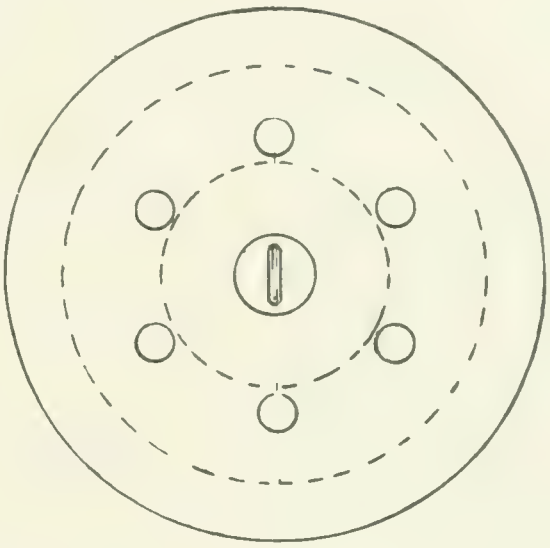


Fig. 2. Cover of Brown's Furnace Showing Manner of Placing Outlet Holes.

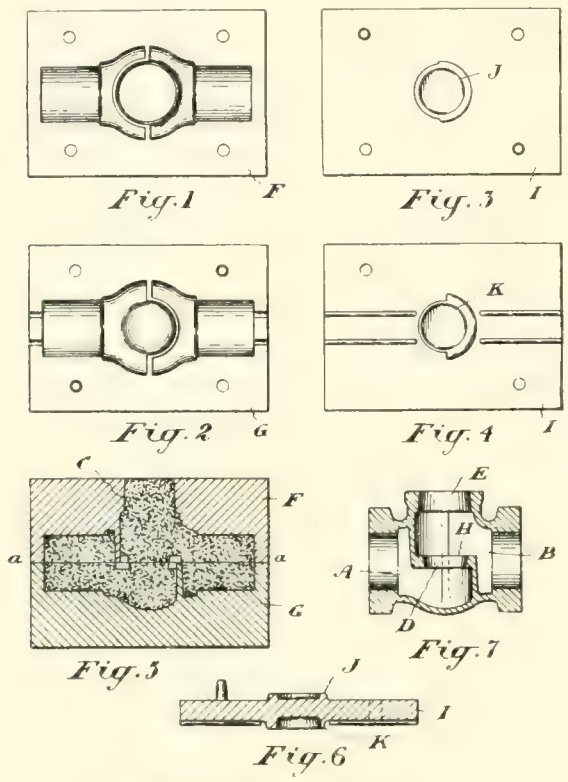
burning the fuel. The cover has not been tried in brass melting, but there is a probability that it will also reduce the loss of zinc in the brass when used in the same manner as that employed in silver melting.

A brass mixture for gas-cocks or other kinds of gas fixture work should not contain too much zinc or the color will not match that of the tubing used with it. The usual mixture employed is about 2 parts of copper to 1 part of zinc.

No plating solution works well when too cold. During the winter months, they should be warmed. Many of the difficulties experienced in the winter are caused by the use of solutions too cold. They should be warmed to a temperature of about 70 degrees F. and all plating tanks are preferably heated by a steam coil rather than with live steam from an open steam pipe. The introduction of live steam not only stirs up the solution unnecessarily, but is apt to introduce dirty water and oil from the boiler.

An Improved Core-Box for Making one Piece Globe Valve Cores.

In the making of valve cores, particularly those of globe valves, it assists in the production of good work if the core is made in one piece and not of half cores pasted together. In the case of a globe valve core, the making of a solid core is not an easy task. Thomas Hawthorne of London, Ont., has recently patented a method of making such a core which is herewith shown.



Method of Making the Core.

The core is molded as follows—A core box is formed in two parts F and G. The lower part G is shaped to form the lower part of the core and the part F the upper part of the core. To form the valve seat H the cover I is provided at opposite sides with the projection J adapted to form the space left in the core for the upper part of the valve seat and with the projection K shaped to form the space in the core for the lower part of the valve seat. The parts of the core box are suitably filled and rammed and the covers applied thereto to form each part of the core complete. Suitable cement material is applied to the exposed surfaces and the two parts of the core box are brought together, as shown in Fig. 5. The core is then complete and may be removed from the core box and suitably dried. The ends of the core are left sufficiently long, of course, to fit the prints in the mold arranged for its support in the ordinary manner. By this method of procedure a core is produced which when in use is substantially a one-piece core though constructed in parts, and which will satisfactorily hold up in the mold in the process of casting the valves.

A New Chromium Alloy.

A new chromium alloy has recently been discovered and patented by James Naulty and John Scanlin of Philadelphia, Pa. (U. S. Patent 974,419, Nov. 1, 1910). This alloy differs from the one previously patented by them (see THE BRASS WORLD, July 1910., page 256) in that it has a slightly reddish shade and is said to be much stronger. The alloy is composed of the following:

Copper	110 lbs. =	66.66%
Nickel	25 lbs. =	15.15%
Zinc	20 lbs. =	12.13%
Chromium	5 lbs. =	3.03%
Aluminum	5 lbs. =	3.03%

The alloy, according to the inventors, is made in the following manner:

Five pounds of chromium and 5 lbs. of aluminum are melted together in a graphite crucible. This, it is said, will occupy about one hour. To this are then added 110 lbs of copper and the heat continued about 30 minutes to melt the mass, after which 25 lbs. of nickel are added. When the nickel has melted, 20 lbs. of zinc are introduced, the whole stirred and poured into ingots or castings.

It is stated by the inventors that the alloy has a tensile strength of 78,950 lbs. in the cast form.

Blisters form more readily upon electroplated metallic surfaces when they are smooth than when rough.

For nickel alloys, manganese has been found excellent as a deoxidizing material and is now extensively used.

A nickel deposit containing a small quantity of iron is whiter than that of pure nickel. Practically all commercial nickel deposits contain a small amount of iron. It is supposed to render them more easily tarnished.

The Disposal of Old Nickel Baskets and Racks.

In the nickel plating of small metal goods, which must be done cheaply and rapidly, it is customary to use a basket made of wire cloth in which the goods are placed in the plating tank. Larger articles are held on racks. Some kinds of goods are wired, but wiring is more expensive than rack or basket plating and cannot be employed for some kinds of work.

When the baskets or racks have been used for some time, they become coated with a heavy deposit of nickel. The longer they are used, of course, the heavier the deposit will be. What to do with the racks has always been a difficult problem for the manufacturer. As a usual rule, nickel anode makers will not purchase them, and they have to be sold for what they will bring, to scrap metal dealers. In such cases they are usually sold at a price far below their actual value.

Some manufacturers have solved the problem in a way that is rather unique and which, upon first thought, would seem unsatisfactory. It has, however, proved to be quite economical and the results obtained appear to warrant the continuation.

The racks and baskets used are made *exclusively* of iron or steel. Brass or copper cannot be used. This is no objection, however, but a great advantage as the iron or steel baskets or racks are much cheaper than those made of brass or copper. After the baskets have been made up, and are to stand for some time, it is preferable to give them a light coating of nickel in order to prevent rusting. This is usually done in the establishments employing the method, as it is usually necessary to have quite a stock of racks or baskets on hand.

The iron or steel racks or baskets thus made are used in the usual manner until the nickel deposit upon them becomes too thick to allow further service. The whole basket and rack, with its nickel coating, is then melted down in a graphite crucible and cast in sand as other nickel anodes. In other words, the old baskets or racks are made into new nickel anodes.

The uninitiated will at once believe that the presence of so much iron in the anodes thus made, would render them unfit for use again. Experience has demonstrated that it is erroneous. All commercial nickel anodes contain from 5 to 10 per cent of iron, added purposely in their manufacture, and in the case of the anodes made from the baskets or racks, the quantity of iron is increased. The anodes thus produced are used in the regular nickel plating tank along with the other anodes. The amount of iron in them does not seem to injure the deposit to any extent.

When iron is present in a nickel plating solution, as it always is, it is not deposited to any great extent when a strong current is not used. Ordinary soft nickel deposits, though made in a solution containing considerable iron and from anodes also containing it, rarely show very much iron. When the deposit is forced, however, by the use of a strong current, the iron is deposited with greater rapidity. In the use of the anodes containing the excessive amount of iron, the iron itself is not deposited in the proportion in which it is present in the anode.

While the use of nickel anodes made from old racks and baskets could not be carried on exclusively as the quantity of iron would then rapidly increase to such a point that it would render the proportion of nickel and iron abnormal, the fact that new anodes are used, with a small proportion of old ones, prevents such an increase in the quantity of iron.

The fact remains that such nickel anodes, made from old racks and baskets with an iron or steel base, are being daily used and with good results. The practice is certainly an economical one although hardly worthy of consideration unless the quantity of nickel plating done is quite large. Small concerns would not find it profitable.

Nickel anodes that have been sand-blasted work better than those left as they come from the sand mold.

Sodium phosphate is used in gold plating solutions to increase their conductivity. Beyond this it has no action.

Sal-ammoniac (ammonium chloride) is preferable to sodium chloride (common salt) in a nickel solution as a conducting salt as it has a much higher electrical conductivity.

Sodium Cyanide and its Relation to Potassium Cyanide in Cost.

While sodium cyanide has been produced for some time, its value in the plating trade has not been appreciated. While sodium compounds are cheaper than potassium, commercial sodium cyanide of the best grade has been sold at a higher price than potassium cyanide or the mixed potassium and sodium cyanides. This has perplexed many consumers.

Cyanide compounds are sold by the cyanogen equivalent, that is the total amount of cyanogen calculated as potassium cyanide. As sodium has a lower atomic weight than potassium, sodium cyanide contains a greater amount of cyanogen than potassium cyanide. For this reason it commands a higher price, although much cheaper for the reason that less will have to be used to do the work.

tion in regard to the relative values of sodium and potassium cyanide:

"You question us in regard to our sodium cyanide. With the following we give you a full explanation of our different cyanides with their percentage of cyanogen and percentage equivalent of potassium cyanide.

The sodium cyanide will come packed in 100 lb. and 200 lb. cases and the label will show that 100 lbs. of sodium cyanide 128-139% are equivalent to 129 lbs. of potassium cyanide."

Cyanogen per 100 lbs. *of the Different Cyanides*

100 lbs. Sod. Cyanide	129% = 129 lbs.	100% Pot. Cyanide contains	52	lbs.	Cyanogen
100 lbs. Sod. Cyanide	100% = 100 lbs.	100% Pot. Cyanide contains	40	lbs.	Cyanogen
100 lbs. Cyanide	98-99% = 99 lbs.	100% Pot. Cyanide contains	39½	lbs.	Cyanogen
100 lbs. Pot. Cyanide	95-96% = 96 lbs.	100% Pot. Cyanide contains	38.4	lbs.	Cyanogen

Relative Cost per lb. *for Cyanogen*

100 lbs. Sodium Cyanide ...	100% @ 22c =	55 cents per lb.	for	Cyanogen
100 lbs. Cyanide	98-99% @ 22½c =	56.96 cents per lb.	for	Cyanogen
100 lbs. Potas. Cyanide	95-96% @ 24c =	62.50 cents per lb.	for	Cyanogen

The value expressed in weight shows as follows:

Sodium Cyanide	100%	77.5 lbs.
Cyanide	98-99%	101.5 lbs.
Potassium Cyanide	95-96%	104.1 lbs.

These are equal to each other in cyanogen. In other words, the same results are obtained with 77.5 lbs. of sodium cyanide as obtained with 101.5 cyanide (the double *sodium and potassium cyanides) 98-99% or 104.1 lbs. of potassium cyanide 95-96%.

The Roessler & Haaslacher Chemical Co., 100 William St., New York City, the largest producers of cyanide in this country and who are now placing sodium cyanide on the market have kindly supplied the following informa-

*When "cyanide" is mentioned, the double potassium and sodium cyanides are meant. This double cyanide is now extensively used. —*Editor.*

Simplifying the Removal of Tin from Tin Plate Scrap.

One of the earliest methods employed for the removal of tin from tin-plate scrap was by means of caustic soda. It is well known that a strong solution of caustic soda, when used hot, has the property of dissolving metallic tin from tin-plate scrap, leaving the bare iron. The solution contains the tin in the form of sodium stannate from which it can be recovered by electrodeposition.

The difficulty that has been experienced in the use of caustic soda is the deterioration of the caustic soda solution so that it will not attack the tin. In order to obviate this trouble, Heinrich Brandenburg of Kempen-on-the-Rhine, Germany, uses the following process:

A certain portion of the solution is constantly removed by means of a pump and fresh caustic soda is supplied in its place. In this manner the process is made continuous. It is stated that the solution will then attack the tin regularly and the usual difficulty, encountered when fresh caustic soda is not supplied, is overcome.

A New Process of Casting Brass for Rolling.

The ordinary method of casting brass bars, rods or tube shells for rolling or drawing is to use an iron mold coated on the inside with a thin film of animal oil. Either lard-oil or some kind of fish oil is employed. The lard-oil is more extensively used as it does not possess the disagreeable odor of the fish-oils. The brass is then poured into the top of the mold from a crucible, the dross and charcoal being held back by a skimmer in the hands of the caster.

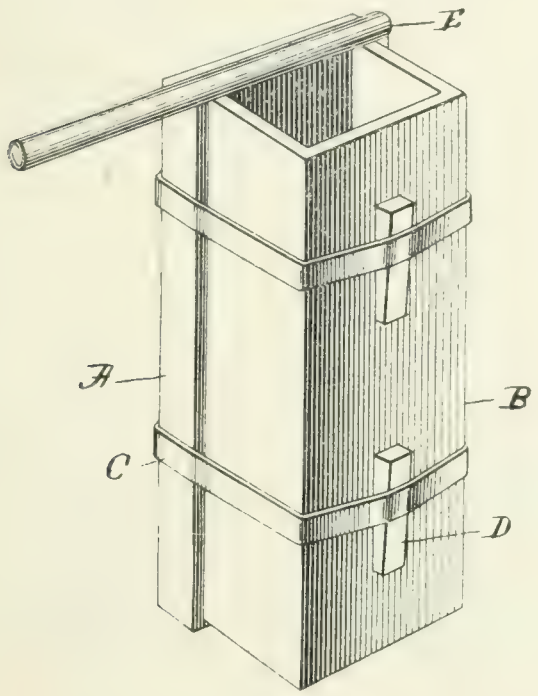


Fig. 1. Method of Casting the Brass with the Air Pressure.

A new process of casting such brass bars, slabs or rods for rolling or drawing has recently been patented by Charles H. Upson of Waterbury, Conn., (U. S. Patent 974,934, Nov. 8, 1910). In his process compressed air is employed and is applied to the molten metal as it enters the mold. The manner of accomplishing it may be readily understood by the accompanying sketches.

A pipe E, running across the top of the mold B, supplies the compressed air when the metal is poured in. This pipe, as shown in Fig. 2, is perforated so that the air issues in a number of small streams and impinges upon the metal.

The advantage of the air, the inventor says, is to prevent the expulsion of the gases in the metal and to obviate the entanglement of air when the brass flows into the mold. While this seems contrary to good practice, the inventor makes the following comment upon the matter:

"I am aware that others have attempted to effect the same result by the use of de-oxidizing gases as, for instance, by injecting into the mold ordinary illuminating gas, thus freeing the mold and metal of oxygen. Such

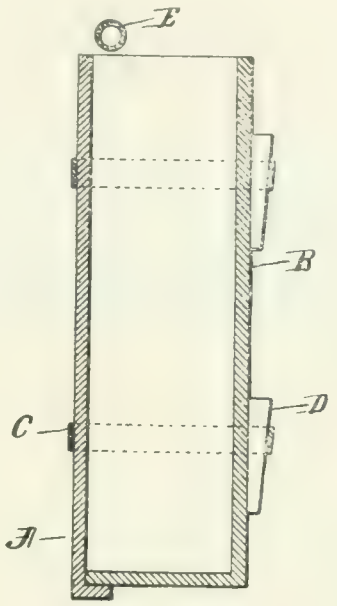


Fig. 2. Cross-Section of the Mold and Air Pipe.

methods, however, are quite the reverse of the one described, as instead of freeing the metal of oxygen, it is my aim and purpose to supply this gas thereto in order that there may be a sufficient quantity of oxygen, or air containing it, to unite with the gases already present to render them inflammable."

Properties of Metallic Strontium.

According to researches recently made upon metallic strontium by B. L. Glascock, it is a light metal with a specific gravity of 2.55 or about that of aluminum. It has a silver white lustre and gradually becomes yellow on the freshly cut surface upon exposure to the air, finally becoming non-lustrous and covered with a white coating. It may be readily cut with a knife and is softer than calcium. It is acted upon by water and hydrogen is evolved.

The metal obtained was 98% pure and it was found to alloy with iron very readily below the melting point of the latter. This was accomplished by the use of pressure, and by such a method an alloy of 77% of iron and 23% of strontium was obtained. This alloy was hard and decomposed water readily.

Some of Roseleur's Views on Acid Dips, and the Value of Soot in Them.

Acid dips for the production of a bright and clean surface on brass, bronze and copper goods are now so extensively used that the views of Roseleur, that remarkable pioneer in the art of electroplating, may be interesting. In connection with aqua-fortis (now the same as commercial nitric acid), he says:

"I must urge upon the operator to be careful in the choice of aqua-fortis. Three kinds at 36° Beaume' are to be found in the trade:

One is perfectly white.

The other is colored straw yellow.

The last is more or less dark red color.

The white acid, without nitrous gases, does not cleanse well, especially when freshly used.

The red acid, which often contains chlorine, bromine or iodine*, acts too powerfully and pits the copper.

The straw colored acid, on the contrary, is a mixture in suitable proportions of nitric and hyponitric acids, and ought to be preferred to the others. Nitric acid at 40° Beaume is too energetic and costly; however, certain operators who have to cleanse large quantities of copper wares, prefer it on account of the rapidity of the operation.

Aqua-fortis is spent when its action on brass or copper goods becomes too slow, and when the objects removed from the dip are covered with a kind of bluish-white film."

The following dip is but little known in the United States, and as far as can be ascertained, is not used. Roseleur, however, recommends it as excellent for cleaning brass and copper work after pickling, and *especially for cleaning sand from brass and bronze castings*:

Roseleur's Dip for Removing Sand From Brass and Bronze Castings.

Muriatic Acid	6 gallons
Old Aqua Fortis	1 gallon
Water	2 gallons

The brass or bronze castings may remain in the dip for half an hour or more to loosen the sand, since the acids act very slowly. After coming from this dip and rinsing, the castings may go to the following bright dip:

Roseleur's Bright Dip

Yellow Aqua-Fortis, 36°	1 gallon
Sulphuric Acid*, 66°	1 gallon
Common Salt	1 oz.

The acids should be mixed the day before using so as to allow them to cool. If used hot, they act too violently, and if too cold, they act too slowly. Roseleur says: "Very good aqua-fortis may cleanse imperfectly when the temperature is too low or too high. This accounts for the difficulty in cleansing in frosty weather, or during the great heat of summer."

In preparing this dip, the nitric acid is first put into the intended stone crock or other vessel, and then the sulphuric acid, which is denser, is poured *into* it. The whole is then stirred with a stick of wood. When the acids are mixed and the common salt is added, considerable heat is produced and obnoxious fumes form, so that it is advisable to do the mixing out of doors unless a chimney with a hood is provided.

If the acids work too rapidly, then more sulphuric acid must be added to slow down the action. When coming from the dip, the articles must be immediately rinsed in plenty of water.

Use of Soot.

The use of soot in acid dips is of long standing and, although not extensively used on account of the lack of knowledge of its value, it is recommended by Roseleur and those who try it will find that it renders the dip smooth in its working so that an even dipped surface is obtained. Roseleur says: "Soot, by its carbon and hydrogen, deoxidizes a small proportion of nitric acid, and the nitrous gas produced unites with the chlorine of the common salt to form a small quantity of aqua-regia necessary for the operation."

The soot used for this purpose must be of the right kind. It is that obtained in the burning of hard wood. It occurs in lumps resembling soft coal and is easily powdered. In fact, it more resembles asphalt, perhaps, though more brittle. Soot from the burning of coal is not suitable and is never used. Dealers in plating supplies always sell soot for use in dips and it is obtained from the chimneys in which wood fire places are used. In the Waterbury, Conn., section, where more dipping is carried on than in any other

*Bromine and iodine are now not found in nitric acid.

*Also called oil of vitriol.

locality, the soot is obtained from the neighboring country people who use wood for fuel.

The soot is used on the top of the dip when made, and from time to time afterwards as the case may require. When the dip is made the day before use, throw a handful of the soot on the top and allow to remain until used the next day. It will then be found to have changed to a white, frothy substance which may be skimmed off or left on as it usually does no harm.

The amount of soot used need not be accurate and it is never weighed. It will serve to produce a smooth and even working dip, and in the large brass manufacturing sections it is extensively employed.

Use of Soft Steel for Drawing.

Now that electroplating has arrived at such a satisfactory condition the use of steel goods has enormously increased. It is possible, by electroplating them to manufacture satisfactory articles at a much less price than were brass employed.

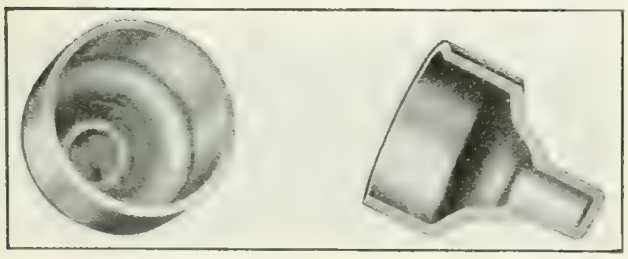


Fig. 1. Heavy Drawn Steel Shells.

One of the classes of goods that is now coming into use more extensively than formerly, are drawn sheet steel shapes such as those herewith illustrated. It may be said that it is only within the past fifteen or twenty years that much attention has been paid to soft steel for drawing purposes. The advent of the basic open-hearth steel process, however, brought about a radical change. Before that time soft steel was practically unknown and the only soft material that could be obtained was iron. This was not homogeneous and was inaccurate in gauge. The basic process, however, allows the production of a steel very low in phosphorus so that it may be drawn and stamped without difficulty. The cold rolling process allows the necessary exactness as to gauge and smoothness to be produced.

Fig. 2. Cupped Sheet Steel.

Soft steel, as now produced, is very ductile and it may be obtained accurate in gauge and free from scale. The extra wear upon the punches and dies is more than offset by the great reduction in cost. In the illustrations herewith shown, some drawn steel articles are reproduced. At one time, it would have been thought impossible to make them out of anything but sheet brass.

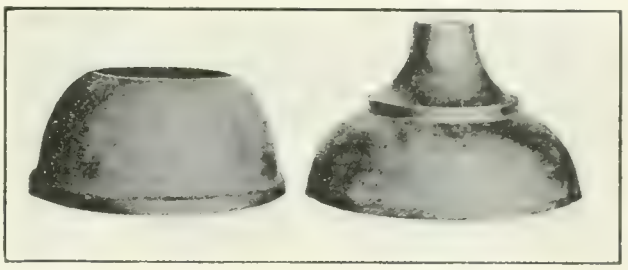


Fig. 3. Lamp or Chandelier Parts Made of Sheet Steel.

The Increasing Use of the Sand Blast.

The increasing use of the sand-blast is a matter worthy of comment. They have been found an exceptionally useful accessory in the majority of metal working establishments, and those who have them installed never cease to praise them.

The extensive use of the sand-blast is in the cleaning of metals, although it has proved particularly efficacious in the satin-finishing and frosting of metal goods. In the cleaning of metals it has filled a long felt want and has superseded pickling in a large number of instances. Not only is it more economical, but a surface is obtained that is better for tinning, galvanizing or electroplating. In the electroplating industry, the sand-blast has worked wonders as it has overcome many of the "spotting-out" difficulties which constantly perplex those who have to plate pickled goods.

By heating electrodeposited nickel that is hard and brittle in an atmosphere of hydrogen to a red heat, it becomes soft and ductile.

The Nickel Industry.*

The world's production of nickel, which showed a marked increase during the years subsequent to 1900, has for the last few years remained fairly constant. The demand has been steady, and there seems to be very little doubt that it would have been much greater had the metal been obtainable at a slightly lower price. The price has been high chiefly through the instrumentality of the International Nickel Company, which has controlled prices in America and has succeeded in influencing outside markets.

The properties of nickel in itself are such that it will always command a wide sphere of utility. Its resistance to the attacks of alkalies, the difficulty with which it is corroded by most acids, its durability, and the high polish it is capable of taking, place it among the common metals. It is these properties that have led to its adoption for such purposes as field and ship cooking utensils and for replacing copper for coinage, while it has long been used for electroplating, and in this respect is but little inferior to silver, while obtainable at a much smaller cost.

Nickel will alloy with most of the useful metals. Among such alloys the so-called German-silver, which consists essentially of nickel, copper and zinc, is most widely known. The most valuable properties of German-silver are its white color, its brilliant lustre, hardness, tenacity, toughness, malleability, ductility, and power of resistance to many chemical influences. The presence of cobalt does not seem to influence these properties. A new alloy known as "Monel-Metal", which consists of three parts of copper and one part of nickel with a small amount of iron and other accidental impurities, has many excellent properties chief of which is its great resistance to the attacks of acids. It is the combination known as nickel steel, however, which utilizes most of the nickel mined at the present day. Nickel steel is principally used for armor plates, but the toughness of this alloy renders it also applicable for other purposes. Recent tests have shown its utility for rails and rivets, and it has been adopted for the barrels of small arms. The presence of nickel, up to 20 per-cent, in steel increases the elastic limit and breaking stress, and steels rich in nickel are practically non-corrodible. Alloys have been made containing a high percentage of nickel, but it has been found that for general purposes, taking into account the relatively high price of the metal, the best result is obtained with the greatest economy when it is present to the extent of about 2 per-cent.

Until quite recently the entire nickel supply of the world was obtained from either the Sudbury district of Ontario, Canada, or from the ores of New Caledonia. The other sources are insignificant compared with these, but there is a possibility of greater development in the near future. About 60 per-cent of the world's nickel supply is mined at the present time in the Sudbury district. As early as 1770, Canada's deposits in Algoma, which borders on Sudbury, were worked as a source of copper; but the true nature of the deposits were not recognized until in recent times the officers of the Canadian Geological Survey pointed out that they would probably be workable. The Sudbury deposits first attracted notice in 1883 during the construction of the Canadian Pacific R. R., and in 1886 they were first exploited for nickel. The ore in this district is mined and treated by two companies—The Canadian Copper Co., and the Mond Nickel Company. A new company, the Diamond Nickel Copper Company has started operations in the Northern range. The ore of the Canadian Copper Co. is chiefly raised from the Creighton mine, which is rich in nickel, while the Mond Nickel Co., obtain their supply principally from the Victoria mines. The ore is melted into matte by the Bessemer process, and this matte, which contains about 40 per-cent of nickel and about the same amount of copper, is then shipped for the production of pure nickel, by the former to Constable Hook, N. J., and Nova Scotia and other places, and by the latter to South Wales. The ores from the Cobalt district, worked for their high silver values, give the only other supply from Canada, but in this case the metal is only a by-product and the nickel content is not reckoned with in the sales.

All the ore in New Caledonia is exported to France, Great Britain and Germany for smelting, although plans have often been discussed for treating the ore on the island. In Great Britain the ore is treated by the Glasgow Nickel Company at Kirkintilloch.

*From the Times Engineering Supplement, July 20, 1910.

There are now two other countries which produce nickel. In Norway it is worked in the valley of Sotersdalen, not far from Christiansand. The output in 1908 was only 81 tons, but has now probably much increased. Nickel was produced in the United States for the first time from its own ores in 1908, by the North American Lead Co., but the production was small. The Orford Copper Co., and the Balbach Smelting & Refining Co., refine nickel, but obtain their supply from the Bessemerized matte from Sudbury or from other sources. A deposit of ore, somewhat resembling the Sudbury ore has been found in Nevada but has not been worked. Particulars of a recent development at Webster, Jackson County, North Carolina, were given recently. Dr. Hennig has worked out a process for the direct reduction in the electric furnace of a nickel silicate ore found there. A product consisting of the silicides of nickel and iron with some chromium, aluminum, magnesium and a little carbon is obtained, which can be applied directly to the manufacture of nickel steel. The production of ferro-nickel, nickel alloys and metallic nickel is also contemplated.

For refining nickel, or obtaining the nickel from nickel-copper matte, various processes have been adopted. The preparation of nickel oxide and direct chemical reduction give an impure product as a rule. Formerly commercial nickel contained only about 94 per-cent of the metal, but in the last few years the commercial metal has greatly risen in purity. An analysis of one of the best makes of nickel would give figures of the following order:

Nickel	99.10%
Cobalt	0.40%
Iron	0.30%
Carbon	0.05%
Manganese	0.05%
Silicon	0.10%

These figures, and the nature of the elements present as impurities, of course, vary according to the nature of the ore and the methods adopted in refining it. In the United States, since 1894, electrolytic methods have been largely employed. Copper is deposited apart from the nickel in the actual electrolysis. Nickel is almost invariably deposited from solutions which have been made alkaline with ammonia, copper having been eliminated in a previous operation. In Germany, the Papenburg works of the Allgemeine Elektro-Metallurgische Gesellschaft, an electrolytic process known as the Hoepfner method has been adopted. In America, the chief uses that have been tried or adopted are the Thum process at the Balbach Company's works, Newark, N. J., the process of the Orford Copper Co., at Bayonne, N. J., the Brown process at Cleveland, Ohio, by the Canadian Copper Co., and the Hybinette process at Sault St. Marie.

The carbon monoxide process adopted by the Mond Nickel Company, at their Clydach works in South Wales, gives nickel of a very high degree of purity, seldom less than 99.9 per-cent, the small amounts of foreign metals being carbon and iron. Since no other element present under ordinary conditions, with the exception of iron to a very limited extent, forms a carbonyl, the nickel is free from other metals, and especially from cobalt which is separated only with extreme difficulty in other methods of refining. The metal appears in the market in the form of pellets varying in size up to 5/16 of an inch in diameter. At present, the works turn out about 1800 tons of nickel a year, but are being much enlarged.

The future production of nickel, at any rate in so far as it will be used for the manufacture of nickel steel will, it seems, lie in the formation of ferro-nickel, by direct reduction in the electric furnace, and with cheap electric power, and by working possibly some of the sources of nickel not yet tapped, it seems probable that the price may be considerably reduced. There are indications, however, that vanadium or mixtures of vanadium and chromium, if the former can be obtained sufficiently cheap, may replace the use of nickel; but, whether or not it is superseded as a toughening addition to steel, the fact remains that pure nickel, by reason of its excellent properties as a metal, must always find its uses, and the extent to which it is employed will depend on its cost.

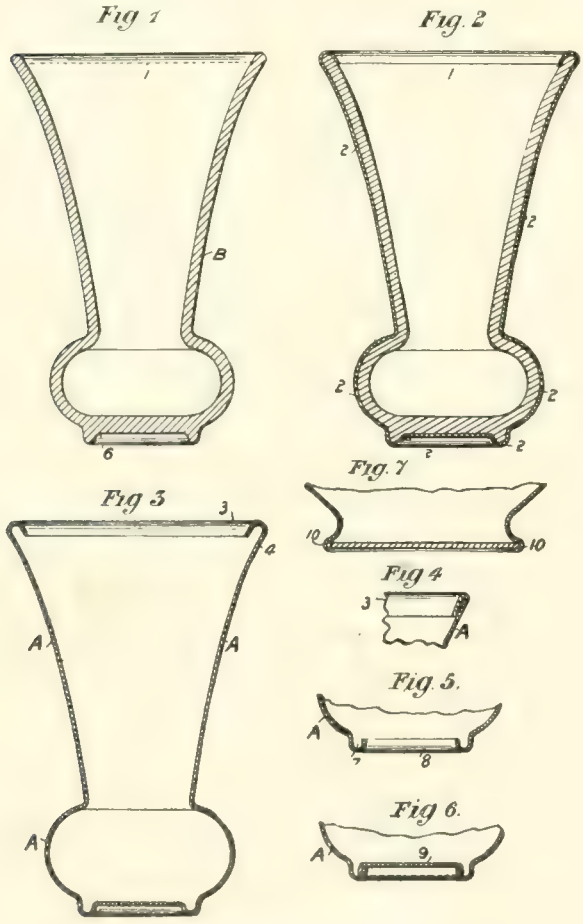
Metallic manganese cannot be deposited by electrodeposition from an aqueous solution as a deposit of the peroxide is formed at the anode, instead of metal at the cathode.

Storage batteries are a very useful adjunct in a plating room as the current for charging costs practically nothing, and they may be used for plating work during the noon hour or at other times when the regular power has been shut off.

Making Ornamental Metallic Articles by Electrodeposition.

A method of making non-metallic articles by electrodeposition has been patented by Frank Iorns Gibbs of Birmingham, England. The process consists in depositing a metal on a glass or other non-metallic surface as follows:

In making the complete metallic vase A shown by Fig. 3, a "model" B Fig. 1 is employed which is an ordinary glass, potteryware or other suitable non-metallic vase, the exterior shape of which corresponds with the internal shape of the required vase shown in Fig. 3. This model is made of glass or glazed potteryware so as not to affect the bath, and its exterior surface is coated with a metallic



Method of Making a Vase.

paint of sufficient metallic strength to convey the electric current. According to this invention the conducting material forming the prepared surface 2 and which covers the outside of the model 8 is carried over the top edge of the model to the line 1 in Fig. 1 inside the vase so that the deposited metal will extend from the outside over the top edge of the model and down to the line 1 in Figs. 1 and 2 and will thus form an inverted channel section rim around the top of the vase when the model has been broken away, or otherwise removed therefrom the upper edge 3 of the vase turning inwardly and forming the inverted channel 4 as in Fig. 3. This overhanging edge can, if desired, be closed in, as in Fig. 4, so as to form a rounded edge, or this channel 4 can be filled up by leaving in it the top rim of the glass or potteryware model which has previously been nicked around by a diamond at the line 1; or the channel can be filled in with metallic paste and the vessel be returned to the bath so that the metal will be deposited over the paste at what was the mouth of the channel, thus making an apparently thick solid edge; or the channel 4 can be filled with solder, or with wire, or with a strip of metal, to strengthen it, and the overhanging rim 3 be closed down over this strengthening wire or strip or solder thus forming a strong bead or rim to the vase. It will be evident that if desired, the foot of the vessel may be similarly formed with an inturned edge as shown for instance in Fig. 5. To accomplish this the said prepared surface will be continued around the foot and finished at the line 6 in Fig. 1 so that when the model has been cracked and removed from the deposited exterior the foot of the latter will have an upturned rim 7 as in Fig. 5 leading to a central hole 8 at the bottom of the vase which can then as in Fig. 6 be closed by a metal disk 9 soldered or otherwise fixed thereto. Or as shown in Fig. 7 the trough section rim 10 around the opening in the base of the deposit may be shaped to receive a disk like metal plate 11 which can be tucked into the trough section bead or rim 10 of the base of the deposited article and this bead can then be closed down on to the rim of the disk 11 or part which closes the hollow base and which will then appear to be a part of the same. After this has been done, the vessel can be returned to the bath so as to deposit some more metal around the foot to hide the joint at 10, so that the disc 11 will then appear to be a part of the vessel.

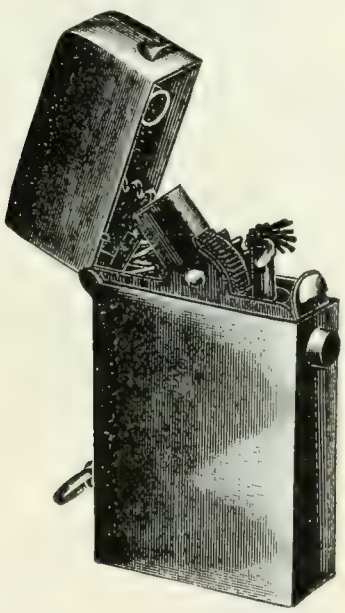
When the metal or other article, such as for instance a vase, is to be formed by depositing the metal on the inside of the model, then the trough section rim will turn outwardly instead of inwardly as will readily be understood, as the conducting surface will extend from the interior of the model over the rim of same, and finish at a definite line on the

outside of the model instead of the inside of the same as previously described. The channel section rim can be similarly formed during the depositing of a metal article which is made perforated in an ornamental design like a saw pierced silver article such as, for instance a tray.

The Commercial Use of Pyrophoric or Sparking Alloys.

Cerium alloys possess the property of emitting sparks when struck and in this respect resemble the well known "flint and steel" method of producing a spark. The cerium alloys, however, produce a larger spark.

Use has been made of the pyrophoric or sparking property of the cerium alloys in the manufacture of a number of useful articles. One of the most unique is in the shape of a match-box herewith shown. The alloy used



Match Box Using the Cerium and Iron Alloy for Sparking.

in this case is one of cerium and iron, and when the box is opened by pressing the spring-catch, the stick of the cerium and iron alloy is brought in rubbing contact with a steel file wheel which causes sparks to be emitted. The sparks ignite a wick saturated with gasoline. The interior of the box contains a mass of cotton wicking which may be saturated with gasoline and thus supply the necessary fuel.

The box is unique in that employment is made of a metal that heretofore has had no commercial use.

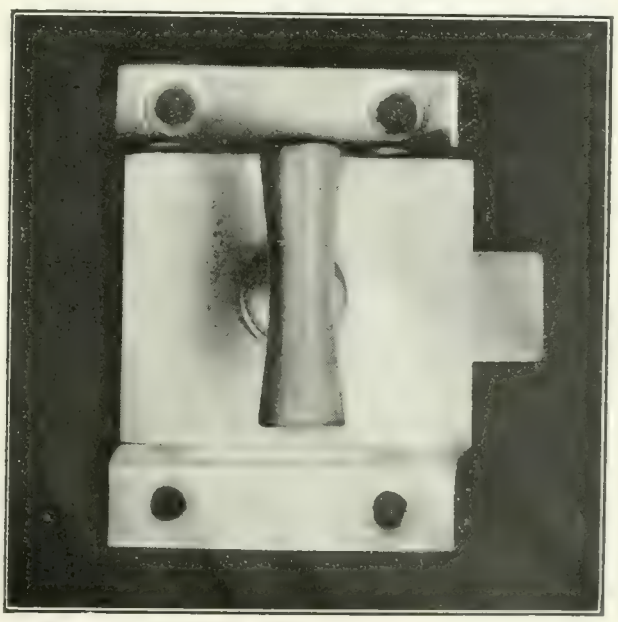
Use of Tantalum for very Thin Grinding Discs.

A method for case-hardening tantalum so that it will possess a very hard surface and allow its use as a grinding substance, has been discovered by Otto A. Simpson of the Siemens & Halske Company of Berlin, Germany.

The tantalum is first sand-blasted to roughen the surface and is then heated in the air to oxidize the surface. An oxide is formed on the surface. This oxide is extremely hard so that the metal thus case-hardened, the discoverer states, may be used in place of the diamond for grinding. The advantage of such case-hardened tantalum, it is said, is in the manufacture of exceedingly thin grinding discs for dental and similar work.

Using Antimony in Place of Tin in Composition or Bronze.

In the making of composition or bronze it is necessary to use some hardening metal in order to produce the necessary hardness. Without such a metal, the mixture would be too soft. It is customary to use tin for the



Hardware Showing Application of the Bronze Mixture Containing Antimony.

hardening metal and the more tin that is added, the greater the hardness. In composition, the cheapest form of red metal, the amount of tin is but a few per-cent, while in

the strong bronzes the quantity is much greater. On account of the high price of tin it has always been desirable to use as little as possible in making composition, but it cannot be eliminated altogether.

For ordinary composition or certain bronzes in which the strength is not particularly important, antimony may be used to replace a part of the tin in the mixture with good results. While all the tin cannot be eliminated, half of it can be replaced by the antimony with satisfactory hardness. Antimony hardens copper but not as rapidly or as much as tin, but when a portion of the tin is replaced by it, a mixture that can be used for many purposes is produced. Take some of the cheap hardware mixtures, for example, such as that from which the article herewith illustrated is made. A portion of the tin used may be replaced with antimony and the mixture cheapened somewhat. Antimony is usually about one-quarter the price of tin. Such a mixture would be as follows:

Copper	85.00 lbs.
Zinc	10.00 lbs.
Tin	1.25 lbs.
Antimony	1.25 lbs.
Lead	2.50 lbs.

Were tin used alone in this mixture, 2½ lbs. instead of 1¼ lbs. would have to be taken.

Various other and similar mixtures may be made in the same manner. One half of the tin is replaced by antimony. It must be borne in mind that while antimony cannot be used to replace tin in all mixtures, and then only in red bronzes, there are many instances in which it can be advantageously used with a saving in the cost of the mixture.

While antimony will harden the bronze, it will not change the color as rapidly as tin. The mixtures obtained when it is used to replace the tin, are slightly redder than when tin is used alone. In addition to the cheapening of the mixture, the antimony acts slightly as a deoxidizing agent and the mixtures containing it are apt to be sounder than when tin is used alone. For cheap valves and plumbers' goods, the antimony can be used with good results, and is actually being used in quite a number of establishments. Its use, however, is nothing new, but is not generally known that it is advantageous as a cheapener. Its use seems to be confined principally to the eastern portion of the United States.

The "Brown" Radiation Pyrometer.

A new radiation pyrometer has been placed on the market by the Brown Instrument Company, 311 Walnut St., Philadelphia, Pa. It is the invention of Richard P. Brown of the company. It has been designed for use in measuring temperatures beyond that possible with the thermo-couple or above 2500° F. At this temperature the thermo-couple rapidly loses its value.

Method of Using the Brown Pyrometer.

The radiation pyrometer herewith described is not exposed to the heat, but the thermo-couple is located at the rear end of the telescope tube shown in the illustration. A concave mirror focusses the heat rays entering the tube on the couple so that an electric current is set up. This current is then transmitted by wires to a milli-voltmeter graduated so that the reading is in the exact temperature of the furnace. It will be appreciated, then, that no part of the pyrometer is exposed to the heat.

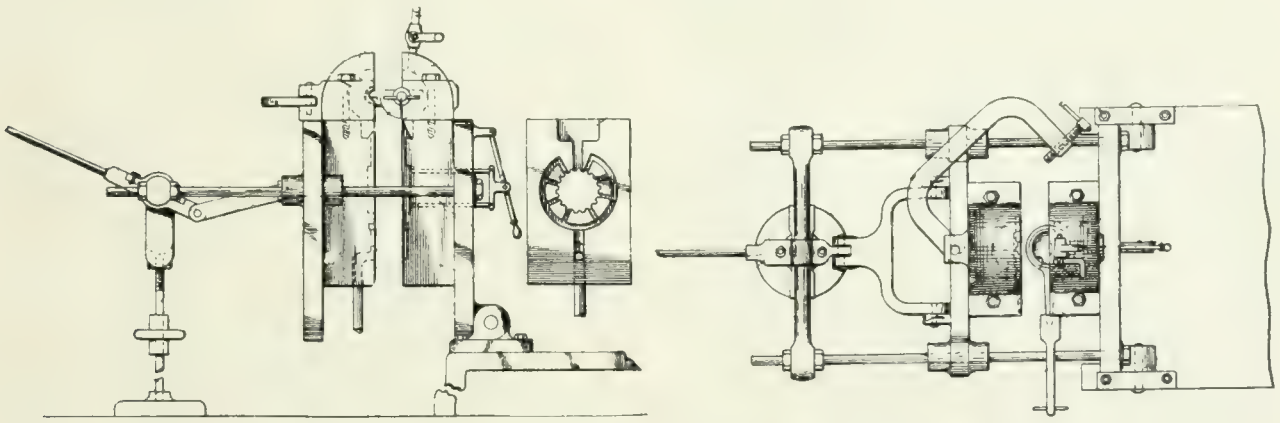
The readings obtained are instantaneous and slight variations in temperature are at once recorded. The focus of the pyrometer is fixed, which greatly simplifies the instrument, and is supplied with a finder, somewhat similar to those used on hand cameras so that by its

use the tube may be pointed directly at the furnace opening.

The instrument is accurate to within 1% and is made extremely portable. The tube is collapsible so that the whole apparatus may be placed in a small case and easly carried from place to place. No skill is required in using it.

A New Method of Casting Brass, Bronze or Aluminum Under Pressure.

A new process of casting brass, bronze or aluminum under pressure has been patented by H. H. Doehler of the Doehler Die Casting Company of Brooklyn, N. Y. (U. S. Patent, 973,483, Oct. 25, 1910). The method, the inventor states, is to be applied particularly to the casting of high melting metals such as brass, bronze or aluminum, and not the low melting metals usually emplayed for die castings.



The Doehler Casting Machine for Casting Brass, Bronze or Aluminum in Metal Molds.

The mold used and which is herewith shown, is made of cast-iron or steel and is provided with a hinge so that it may be tilted. The metal is placed in a ladle coated with graphite or other non-conducting material to prevent loss of heat, and the whole then inserted in the chamber at the top of the mold as shown in the illustration.

At the bottom of the mold a pipe is connected and this is attached to a vacuum pump so as to produce a vacuum in the mold. At the top of the mold another pipe is used for forcing compressed air into it. The mold is then tilted, and at the same time the compressed air valve is opened so that the metal, as it leaves the ladle is forced into the mold. By the use of the combined vacuum and pressure, the metal is made dense and sound.

Brass for Automobile Hardware.

The automobile trade now forms one of the large outlets for yellow brass castings, and many brass foundries are now exclusively occupied in making such castings, while others find it a profitable business as a subsidiary line.

The trade requirements are rather peculiar and somewhat severe. They may be summed up as follows:

1. The brass shall be of the right color. A genuine yellow brass is required and one which will match the color of rolled brass sheet. Brass containing too much spelter and thus having a reddish shade will not give good satisfaction and frequently will not be accepted.

2. The castings shall be free from pin-holes so that they can be polished to a good surface without showing any imperfections.

3. The brass shall turn or cut freely in order to allow machine work to be done upon it readily.

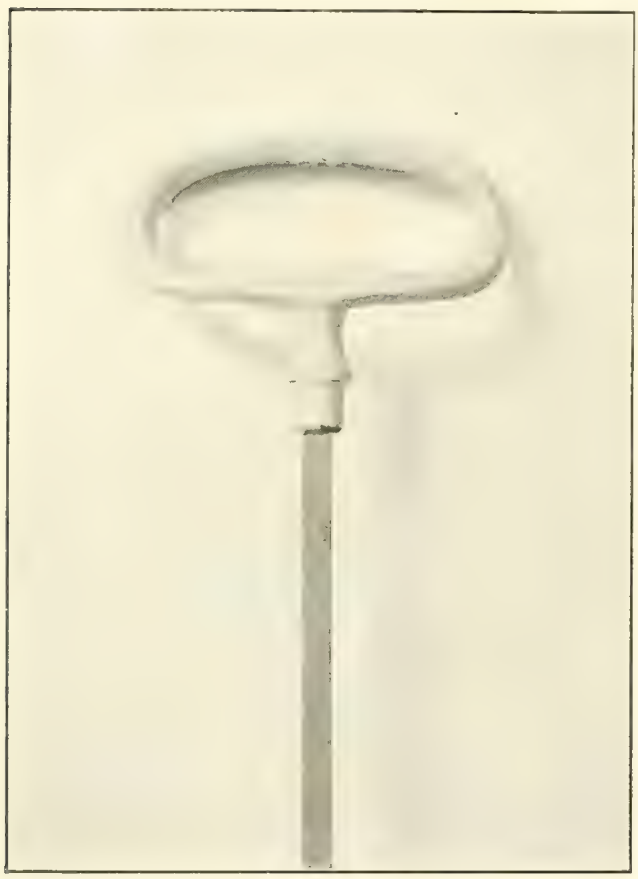
4. The castings shall be sufficiently strong to stand the strain put upon them.

In order to obtain the desired color it is necessary to use the right mixture. To be free from pin holes, care must be used in melting, and the use of a small quantity of aluminum is quite imperative. It will prove a great source of profit to the brass founder. In order to cut freely, the mixture must contain the right quantity of lead. If too much lead is used (and this is a frequent error on the part of brass founders) the castings lack strength and are apt to break.

To meet these requirements, the following mixture is strongly advocated:

Copper	65 lbs.
Zinc	32 lbs.
Lead	3 lbs.
Aluminum	4 oz.

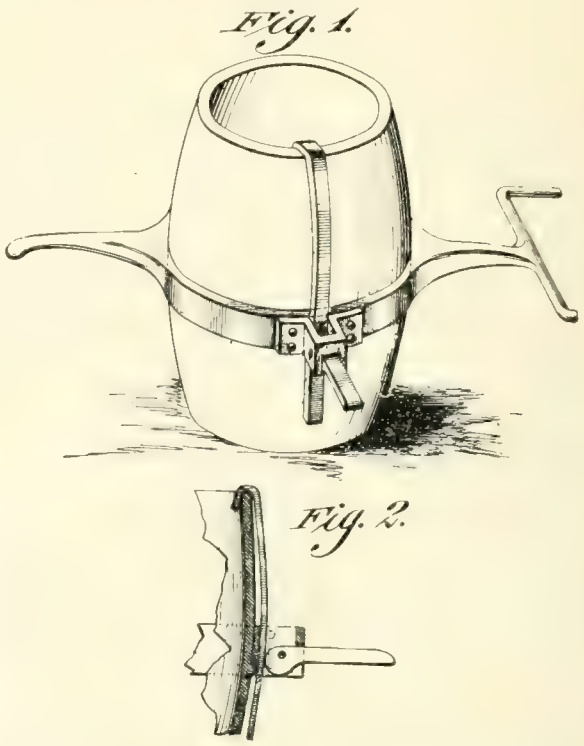
This mixture will have the desired yellow brass color which will match that of ordinary sheet brass, from which the lamps, radiators, trimmings and other brass parts of an automobile are made. The quantity of lead will render it free cutting without making it brittle so that the hardware will stand the necessary strain. The use of the aluminum will allow castings free from pin holes to be made, but in using it, it must be borne in mind that the brass should be poured rather cold as good castings cannot be obtained unless it is done. When poured too hot, yellow brass containing aluminum will give dirty castings, but when poured at the right temperature clean castings are produced that will take a high polish without showing pits or other imperfections. In connection with the use of aluminum in yellow brass for making automobile hardware, it may be said that practically all the makers are now using it.



Type of Brass Hardware Used on Automobiles.

A Device for Holding a Crucible in a Pouring Shank.

A device for holding a crucible in a pouring shank has been constructed and patented by Edward P. Carr of Philadelphia, Pa., (U. S. Patent, 976,042, Nov. 15, 1910). One half of the patent is owned by the Wm. Cramp & Sons Ship & Engine Bldg. Co. The device is herewith illustrated.



Carr's Device for Holding a Crucible in a Shank.

It consists of an arm supplied with a hook at its top for fitting over the top of the crucible. In the shank-ring, a clamp worked by a cam lever is used which holds the arm in place. The object of the device is to do away with an extra man when pouring from a shank. When not used, a third man to "hold-back" is required.

An Improved Process of Making an Emery Wheel.

A Swedish process for making emery wheels has recently made its appearance. It is claimed that emery wheels so made have more cut than vitrified wheels and can be cheaply produced. The method of making it is to mix emery or other abrasive, with flint and quartz sand and then bind with Sorel cement.

The proportions may be varied, but the following are recommended: 1000 parts of flint and 2000 parts of emery. The Sorel cement is

composed of burnt or calcined magnesia wet with a solution of magnesium chloride. It is well known that such a composition will harden in a short time. The emery and flint are mixed with 1200 parts of magnesia and the whole moistened with a strong solution of magnesium chloride. The mass will become hard after 26 hours and after 8 days is ready for use. It is said that the wheels made from such a mixture preserve their sharpness for a long time.

Improved Centrifugal Machines for Drying-Out.

The Centrifugal Dryer Co., 93 Foster St., Worcester, Mass., have recently improved their drying out machines so that they are more easily operated. They are supplied with a hand hoist for use in lifting the basket, thus obviating the need of manual labor. The crane, which may be seen in the illustrations,

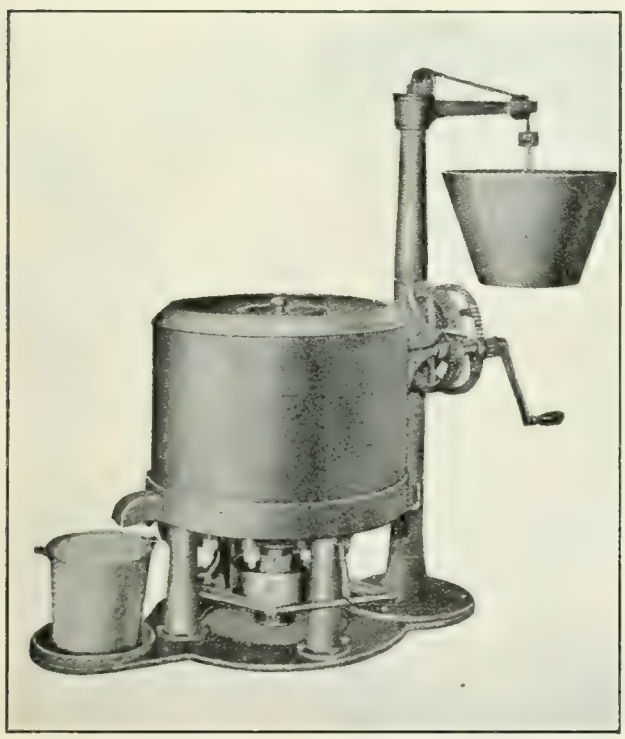


Fig. 1. Centrifugal with Hoist and other Improvements.

is operated by a crank so that the basket, which is made in capacities up to two bushels, may readily be lifted from the machine and swung to one side for emptying.

The machine is made to be operated by means of a pulley underneath the machine that can be driven with the usual belting from a countershaft, or by use of an electric motor as herewith shown. One man only is required for operating it and about 2 H. P. are used in running it at the necessary speed.

The machines may be used for drying out a large variety of small metal goods in a rapid and efficacious manner thus avoiding entirely

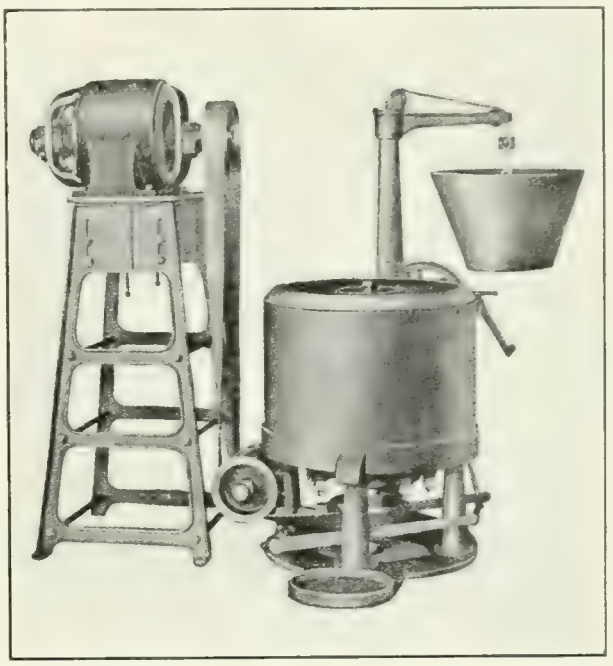


Fig. 2. The Centrifugal Driven by a Motor.

the use of sawdust with all its disadvantages. They may also be used for the removal of oil from metal chips, waste and other kinds of material.

The Etching of Nickel.

In experiments made with the intention of finding some metal to take the place of copper for making etched half-tone plates for the reproduction of photographs for printing purposes, Messers. Cooper and Freak stated at the International Congress of Photography held in Brussels, Belgium, that results were obtained as follows:

While copper gives satisfactory results, it is so soft that the half tone plates soon wear out. A harder metal that could be etched in the same manner was desired. Nickel, cobalt and steel were tried and these as electrodeposits.

It was found that nickel and cobalt could be etched the same as copper with iron perchloride, but that no matter what strength and temperature was used, the etching took twice as long. In their researches they found, that in etching copper, the most efficient strength of the iron perchloride solution at ordinary temperatures is 31.9° Beaume'.

Modern Practice in Sterling Silver Melting.

The melting of sterling silver, contrary to the usual belief, is not unlike that of brass or bronze. As now made in the United States, and required by law of a number of states (there is no United States law in regard to the fineness of sterling silver), it shall consist of *at least* 925 parts of fine silver in 1,000 parts. There is no stipulation in regard to the material which is used for the remainder. It may be any metal, as far as that is concerned. For techinal reasons, however, it is always customary to employ copper as the alloy. As now made, therefore, sterling silver consists of:

Silver	925 parts
Copper	75 parst

As practically all sterling silver is rolled into sheet or drawn into wire, the purest metals obtainable must be employed. This point is now well understood and care is exercised by manufacturers to see that they are obtained.

The melting is always done in graphite crucibles and oil or gas furnaces are now almost exclusively used for the reason that there are no ashes to grind and treat like those which follow when coal or coke is employed. As far as known, there are no makers of sterling silver who now melt with coal or coke. Oil is usually preferred to gas on account of being cheaper.

The copper and silver are placed in the crucible together and kept well covered with charcoal. As soon as the copper has melted the metal is stirred with a graphite stirrer. Iron can be used but graphite is preferable and more extensively used on account of not introducing any iron into the silver. When the copper is melted, the silver, which melts at a much lower heat, will also be liquid.

Care must be taken to have the heat sufficiently high to melt the copper. This point requires experience as the melting point of the copper is so much higher than that of the silver that to all appearances a good melt may be obtained and yet have some of the copper left unmelted. The mass is then well stirred and is ready for pouring.

The old practice of inserting a piece of tool steel in the silver and noticing whether it "sizzles" is now obsolete. It is open to the objections that it is apt to introduce iron in the silver, and that such a temperature is altogether too high. The silver should be poured at a low heat rather than a high one and less pin holes resulting in blisters will be obtained.

Iron molds are used for casting the silver and they are oiled on the surface before pouring. The molds are set vertically and the pouring is carried on in rather a rapid manner in order to hasten the operation as much as possible and avoid exposing the silver to the air any longer than is necessary. The cast bars are cooled in water when set as this facilitates matters and experience has demonstrated that it has no effect upon the quality of the metal.

Action of Sodium on Metallic Lead.

Metallic sodium alloys with lead in all proportions. The alloying may be carried out easily by introducing the metallic sodium in the molten lead and stirring.

The sodium has the remarkable property of hardening the lead, even when present in small quantities. An alloy of 98% of lead and 2% of sodium is sufficiently hard to ring when struck. With a few per cent more, the lead becomes brittle.

The rapid hardening of the lead is brought about by the fact that the specific gravity of the sodium is very low, 0.97 (or lighter than water) so that 1 per cent. has the hardening effect of many times that of the heavier metals.

Lead containing sodium oxidizes readily in the air with the formation of a layer of sodium hydroxide on the surface. The alloy of 98% of lead and 2% of sodium was used at one time as an anti-friction metal.

Common salt is one of the best fluxes for copper and its alloys as it has the property of reducing any oxide of copper formed during the melting.

An alloy of iron and nickel, containing 24.5 per cent. of nickel, is non-magnetic at ordinary temperatures, but when cooled below O° C. it becomes magnetic and remains so upon returning to the normal temperature again. When heated to 600° C. it again loses its magnetic properties.

Making Seamless Tubes by the Extrusion Process.

The manufacture of seamless tubes or tube shells by the extrusion process has never been quite successful on account of the lack of knowledge of the right method of making the die and plunger in the extrusion machine. Rods and solid shapes have been quite successfully made, and while theoretically tubes were possible, the mechanical difficulties retarded their production.

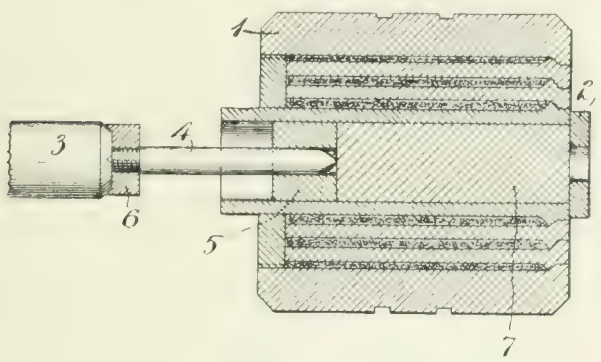


Fig. 1. The Container Head.

A process for producing tubes by the extrusion process has been patented by William Westerman (U. S. Patent 976,529, Nov. 22, 1910) superintendent of the Coe Brass Mfg. Co., at Ansonia, Conn. The method may be understood from Figs. 1 and 2. In Fig. 1 is shown the container head of the extrusion

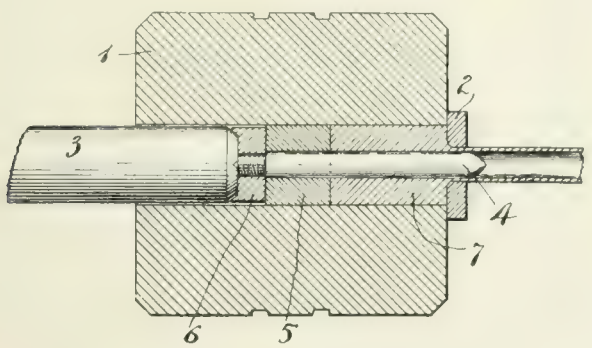


Fig. 2. Method of Extruding the Tube.

machine. In front of the billet 7 a dummy 5 is placed through which the mandrel 4 passes. In operation the mandrel passes through the dummy and pierces the billet (previously heated) until the die 2 is reached, after which the ram 3 begins to act and forces the metal out of the die 2 in the form of a tube.

Cadmium is now extensively used in the manufacture of sterling-silver as a deoxidizing material.

Lead Poisoning in the Cutlery Trade.

Metallic poisoning is less rarely found in the United States than abroad. Why this should be is not clear. The following description of a case of lead poisoning in an English establishment indicates a condition rarely found in our own country:

"At Sheffield on September 29 an inquest was held concerning the death of a table knife hafter named Downes, employed by S. & J. Kitchin, of Soho Works, Sheffield. A sister of the deceased stated that her brother had been healthy until four years ago, since when he had had several bad stomach attacks with partial paralysis of the hands and legs. Brothers of the deceased, who were also hafters, suffered in a similar way, and one of them had been compelled to give up his occupation in consequence. A post-mortem examination showed that lead-poisoning was the cause of death."

Inspecting Brass or Bronze Castings.

In a paper presented at the meeting of the Pittsburg Foundrymen, Nov. 7, 1910., on "The Inspection of Castings", J. A. Gearhart made the following remarks in regard to the inspecting of brass or bronze castings:

When inspecting brass or bronze castings, aside from the tests and analysis when specified, the inspector should break a few castings from each day's work. This will enable him to obtain an idea of the structure of the material, as well as give him an opinion of how well the metals have been mixed, and if they have been properly stirred in the melting. Any segregation or soft and porous spots will be detected, which is important in castings used for bearings, as any segregation generally develops a hard spot, while soft or porous spots act as a catch all for dirt, both of which in time cause unequal wear or hot journals.

Erratum.

In our October issue, the article published on the casting of brass cannon in England, should have mentioned that the incident took place 50 years ago and not at the present. As published, it is apt to convey a false idea of the manufacture of armament in that country.

Questions and Answers.

QUESTION No. 900. In making steam valves, we have a large percentage of leakages. These valves are tested at 300 lbs. per sq. in. and we frequently lose as high as 25% of them. We are using electrolytic cathode copper and the best tin, lead and zinc. What is the cause?

Answer. The leakage in steam metal valves may be caused by several things: First, it may be due to the gating. Second, the metal may be poured too cold. Third, the metal may be overheated in melting. Fourth, the pattern may be defective. Fifth, the core may not be made right or may have shifted in the mold so that the thickness of the valve is lacking. You will have to investigate the matter yourself and see what the cause is. We suggest the use of ingot copper, however, as cathode copper, on account of the large amount of surface exposed in melting, oxidizes much more than the ingot metal.

QUESTION No. 901. In the production of the "Heat-Black-Finish" as described on page 245 of THE BRASS WORLD, July 1910., we find that the surface, after heating and brushing is very rough and frothy. We mixed the nitrate of silver and nitrate of copper solutions and brushed on the brass. Then heated and brushed again with the preceding result.

Answer. Your difficulty is that your nitrate of silver or nitrate of copper contains free nitric acid which acts on the brass in heating and gives the rough surface. Your nitrates should be neutral. See page 385 of this issue.

QUESTION. No. 902. We have a customer who has been using genuine babbitt metal, but owing to the increased price of tin he feels that he cannot pay the price that is demanded. He wants to have us make a babbitt that will be cheaper and answer his purpose, and yet be as near to the genuine babbitt as possible. Kindly give us a mixture for the purpose.

Answer. We advocate the use of the following mixture:

Tin	73½ lbs.
Lead	15 lbs.
Antimony	10 lbs.
Copper	2½ lbs.

If you find that this mixture is harder than you desire, add less copper.

QUESTION No. 903. Is there such a process as plating with "Nickel Steel"? We have heard that it can be deposited directly on wax molds for the production of electrotypes. It is said to be harder than the straight nickel deposit.

Answer. An alloy of nickel and iron may be deposited by adding sulphate of iron to a regular nickel solution. The iron deposits with the nickel and the alloy of nickel and iron is much harder than pure nickel. Little is known about the electrodeposition of nickel and iron other than the fact that it can be deposited. The right conditions and strength of the solution do not appear to have been determined. We understand that such an alloy is deposited by certain electrotypers in making electrotypes, but the details of the process are keep secret, and as the method is comparatively new, information in regard to it does not seem to have been obtained.

QUESTION No. 904. Is brass injured in melting by having pieces of the gates used as scrap projecting above the top of the crucible?

Answer. Yes! Your brass is not as good when it is done. Any surface that is exposed to oxidation or direct heat during melting is injured. Cut your gates up or break them so that they will not project above the top of the crucible.

QUESTION No. 905. Is there any better white metal than 30% German-silver for use in making jewelry? The metal must roll easily and not turn green when it comes in contact with the perspiration of the body.

Answer. While 30% German-silver is good, you will find pure nickel better as it is more non-corrosive although it does not have as white a color as the German-silver. Pure nickel can be obtained in the form of sheet metal. We know of nothing better among the common metals and if the color is right suggest using it. If, however, it is too gray, then you will have to use the German-silver.

QUESTION No. 906. Does the stirring of brass with an iron rod injure it? We have heard that it produces brown or black specks in the castings.

Answer. For ordinary brass castings, stirring with an iron rod has no objections and it is done in nearly all brass foundries. The amount of iron introduced is so small that it cannot be taken into consideration. In melting phosphor-bronze, iron should not be used as it is rapidly attacked. For fine grades of metal, too, it is not advisable to use it. For ordinary brass work, however, an iron stirrer is always employed.

QUESTION No. 907. In making a copper deposit on brass by means of an acid copper solution, what is the best method of preventing the adherence of the copper to the brass?

Answer. Rub the surface of the brass with a little grease and then with the finest electrotypers' graphite. The copper deposit can then be stripped off.

QUESTION No. 908. What causes sand to adhere to composition castings after they have been dumped from the mold? We are troubled by rough castings.

Answer. The cause of the sand adhering to the mold is the use of poor molding sand or pouring the metal too hot. The molds should be faced with old sand that has been well burnt so as to give a smooth surface. Possibly you are using all new sand and that which is not suited for your work.

QUESTION No. 909. I am having some trouble in nickel plating automobile radiators. They are honeycombed and are built up of sheet

brass and copper. While in the nickel bath the solution attacks the honeycomb and causes the deposit to become very dark and streaked. After plating a few of these, the solution begins to work very badly, and when the radiators have been in a sufficient length of time, the deposit very often cracks and peels. How can the difficulty be overcome?

Answer. The plating of an article of this kind is a difficult matter. Your trouble is apparently caused by the solder used for soldering the copper tubes together. The solder becomes oxidized and when the nickel is plated over on, it does not "take." The only remedy is to scour the solder clean. You will do better to first deposit some copper on the radiator in a cyanide copper solution, and then deposit the nickel on this. In any event, however, you will have to clean the solder. This appears to be your difficulty.

QUESTION No. 910. We have a large quantity of millings from red brass that we produce in our machine room and wish to make it into castings again. How can this be done?

Answer. The making of ingot metal from the chips should first be done and then these remelted for making your castings. Do not attempt to make castings direct from the chips as there is so much oxidation that the castings are apt to be poor. The chips are simply melted in a crucible and then poured into ingots. Do not use too small a crucible or there will be considerable loss in charging the chips into it. In melting, keep the crucible well filled and stir frequently. When full, the crucible is removed from the furnace and skimmed and the metal poured into ingots. The loss in melting will depend upon the care used, but you will probably find it will run from 5 to 10 per cent. unless you have had experience in the work.

QUESTION No. 911. I wish to deposit an alloy of nickel and chromium on mica. It must adhere to the mica and not peel. The alloy is called "Nichrome." Please inform me how it can be done.

Answer. This is a problem that we fear has not been done. The electrodeposition of two metals is always a difficult matter, but to deposit nickel and chromium together is something which has never been done, and we doubt whether it is possible to do it. We are unable to give you any information on the subject.

QUESTION No. 912. I find small specks of iron in our sterling silver sheet. I believe that they come from the molds as portions of the mold are often found eaten away by the hot metal. I have had an idea that the molds are not made of the right kind of iron. Is there any kind of molds that will not become atacked in this manner by the melted silver? If so what are they?

Answer. Your difficulty is that you are pouring your silver too hot. Cast-iron is always used for the molds and one kind will be attacked as well as another if you pour your metal too hot. Sterling-silver should be as cold as possible as you will then find that you will have less blisters in the sheet when rolled. Your trouble is as you say, caused by the iron from the molds. Any metal will attack the molds in this manner if poured too hot.

QUESTION No. 914. In THE BRASS WORLD, May, 1910, page 168, is given a formula for bronze automobile bushings. The formula consists of the following:

Copper	80 lbs.
Lead	10 lbs.
Tin	5 lbs.
5% Phosphor-Tin	5 lbs.

Will this mixture answer for bushings 1⅞ in. outside diameter and 5/16 in. in thickness? These bushings are 6 inches long and the shaft revolving in them makes 1500 revolutions per minute.

Answer. You will find this mixture excellent for your purpose. Do not use any zinc in it or you will find difficulty to cast soundly.

QUESTION No. 917. How can hot tinning be done on steel goods so as to obtain a bright, smooth surface? I have not succeeded in obtaining a smooth surface although the tin seems to adhere to the steel. The steel articles are of sheet metal.

Answer. You are undoubtedly using but one tinning kettle. It is impossible to obtain a smooth tinned surface when this is done. The first tinning kettle is used simply to obtain a tin coating on the metal without regard to its smoothness. The steel is dipped into chloride of zinc flux and then immersed in the kettle. This serves to tin the surface but with a rough coating. The second tinning kettle is kept covered, to a depth of an inch or so, of tallow. The articles tinned in the first kettle are taken separately in tongs and immersed in the kettle. The flux of tallow causes the surface to become smooth and bright. In this second tinning kettle it is necessary to do each piece separately.

QUESTION No. 918. What flux will take the dirt out of brass room polishing and sweepings, and at the same time form a scum over the top of the metal when melted so as to prevent oxidation? As it is now, when we melt our sweepings in a crucible, the result is that very little brass is recovered and the crucible is almost completely filled with dirt. The refiners and smelters must know of a flux, otherwise their operations would not be profitable.

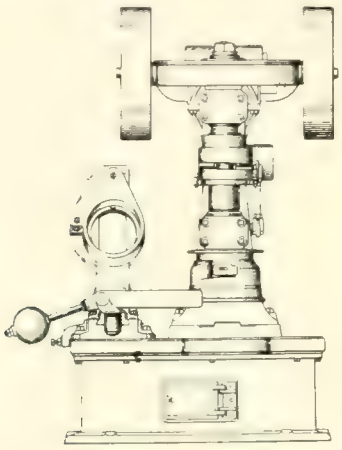
Answer. Your difficulty is that the grindings and sweepings are so fine that excessive oxidation takes place during the melting. What is needed is a flux to dissolve the oxide formed and allow each particle of metal to unite with others. There are two fluxes that can be used successfully:

1. Equal parts of sand and soda-ash.
2. Three parts of lime and one part of fluor-spar.

Either of the fluxes will clean the metal. Use about 5 lbs. of the flux to each 100 lbs. of grindings (and more if found necessary), and then skim off before pouring.

Patent Abstracts.

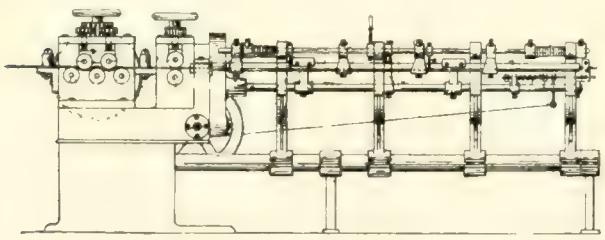
974,723, Nov. 1, 1910. WIRE DRAWING MACHINE. H. E. P. Taylor of Seymour, Conn. Assignor to the Coe Brass Mfg. Co., of Torrington, Conn. A wire drawing machine adapted for drawing fine as well as



large sizes and which has been simplified so as to reduce the cost of installation. The machine has been made in a self-contained manner so that it may be placed in positions not otherwise possible.

976,221, Nov. 22, 1910. LIQUID FUEL BURNER. William Scrimgeour of Portsmouth, Va. Assignor to the Mircs Fuel-Oil Equipment Co., of Norfolk, Va. A burner for burning fuel-oil and intended for use in the open air. The burner is provided with a hood for shielding the flame and arrangement for preventing it from becoming extinguished.

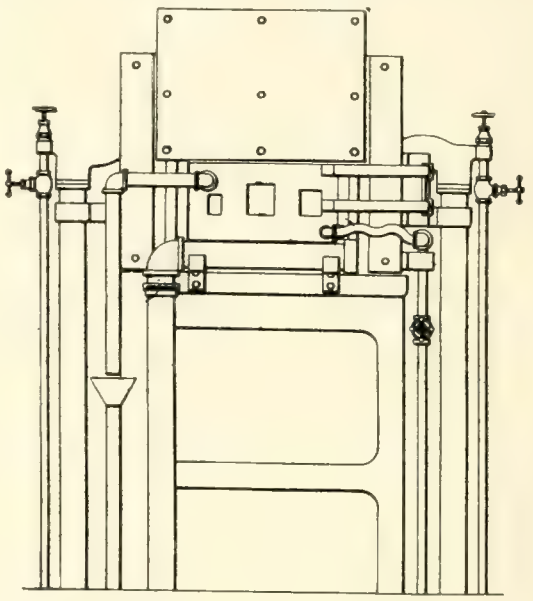
973,571, Oct. 25, 1910. STRIP METAL STRAIGHTENING AND CUTTING OFF MACHINE. Franklin B. Shuster of New Haven, Conn. This machine is intended for



the straightening and automatic cutting off, to a pre-determined length, of narrow strips of sheet metal.

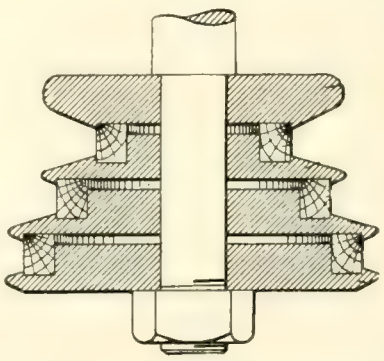
973,592, Oct. 25, 1910. SOLDERING IRON. Tycho Van Aller of Schenectady, N. Y. Assignor to the General Electric Co., of the same place. An electrically heated soldering iron in which the point or tip of the iron is heated by a resistance member. This member is situated very near the extreme top so as to obtain the full advantage.

975,068, Nov. 8, 1810. FUEL OIL OR GAS FURNACE. Wirt S. Quigley of New Jersey, Assignor to the Rockwell Furnace Co., of New York City. The furnace is intended for the heating of steel so that only the ends of



the bars or tools will be heated. It is applied more particularly to the tempering of tools, especially high speed steels, and results similar to those obtained in a coal furnace are produced.

975,979, Nov. 15, 1910. WIRE DRAWING MACHINE. Ralph L. Morgan of Worcester, Mass. The invention is an improvement in the capstan of continuous wire drawing machines. Wood is inserted in the portion

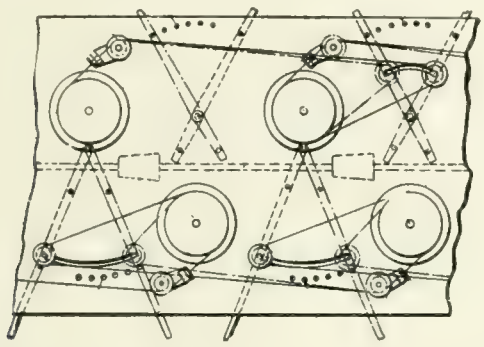


over which the wire passes so that particles of metal are not removed by abrasion during the drawing operation.

975,782, Nov. 15, 1910. SAND BLAST APPARATUS. Wm. P. Mott of Chicago, Ill. A sand blast, the principal feature of which is in the device for handling the sand and for regulating the supply of same. Means are also provided for the removal of obstructions from the outlet of the storage tank.

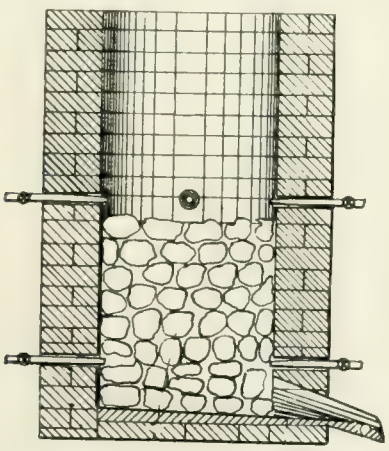
975,844, Nov. 15, 1910. METAL SCRAP COMPRESSOR. Solomon W. Egbert of Joilet, Ill. Assignor to the American Can Company of New York City. A machine for compressing tin-plate scrap into masses weighing 50 or 100 lbs. The scrap is fed into a mold and compressed by means of a steam hammer acting upon it. Various acessory devices for ejecting the mass and also for filling the mold are provided.

975,641, Nov. 15, 1910. CONTINUOUS WIRE DRAWING MACHINE. Harry Saville of Manchester, England. Assignor to the British Steel & Wire Co., of the same place. The machine has been constructed so that, in the continuous drawing of wire, it will not



slip around the drums on account of their revolving at the wrong speed. A mechanical variable speed regulating device is used which is controlled by the pull exerted on the wire by the next succeeding drum.

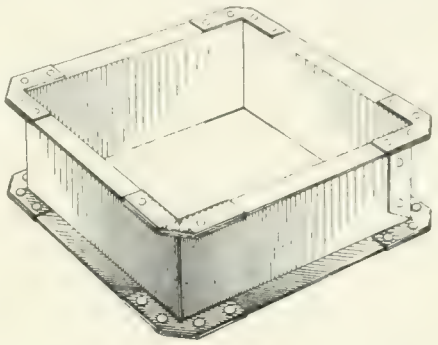
975,826, Nov. 15, 1910. OIL HEATED MELTING FURNACE. Arthur T. Brown of San Francisco, Cal. A method of using oil in a cupola or blast furnace. The bottom of the furnace is filled with large lumps of a



refractory material which are kept hot by a second series of burners.

973,907, Oct. 25, 1910. MOLDING FLASK. James Barker of Philadelphia, Pa. An adjustable flask particularly for floor molding. Arrangements are had for changing the positions of the cross-bars and for using the two parts for either a cope or nowel.

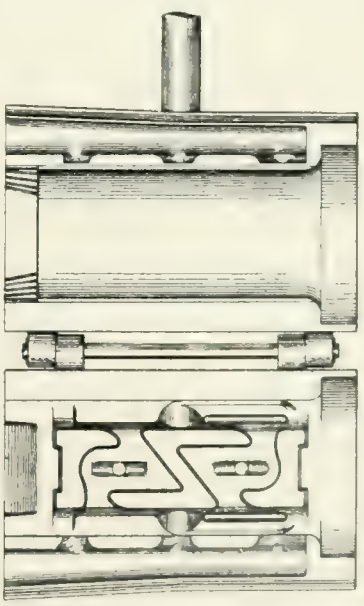
975,351, Nov. 8, 1910. SNAP BAND FOR MOLDS. Chas. H. Green of Chicago, Ill. Assignor to the S. Obermayer Company of Cincinnati, Ohio. A method of making snap-bands for use in molding. The improvement



is in the cheap and efficient method of reinforcing the flanges. Reference to the illustration will serve to indicate the manner in which the band is made.

976,760, Nov.. 22, 1910. PYROPHORIC MASS. Carl Auer Von Welsbach of Vienna, Austria-Hungary. Assignor to the firm of Treibacher Chemische Werke Gesellschaft M. B. H., of Treibach, Austria-Hungary. A method of making a pyrophoric alloy of cerium and iron. The improvement is that of impregnating the alloy with the oxide and nitride of cerium which renders the alloy much more pyrophoric so that a sheet of flame will result instead of small sparks.

974,529 and 974,530, Nov. 1, 1910. JOURNAL BEARING MOLD. Herman F. Schroeder of Berwyn, Ill. A method of making molds for casting the soft bearing metal shells or liners so that they may be removed



without injury to the mold. The mold is made of two hinged parts gated as shown in the illustration.

Trade Items.

The Bantam Anti-Friction Co., Bantam, Conn., manufacturers of ball-bearings, are obtaining estimates for a brass foundry plant.

The Reed & Prince Mfg. Co., of Worcester, Mass., manufacturers of screw machine products, are now manufacturing art metal goods in brass and are placing upon the market a line of artistic candlesticks of cast brass.

The Winkley Company of Detroit, Mich., are to build a brass foundry at their works to be erected in Windsor, Canada. Small brass goods are manufactured in Detroit and a similar line will be made in Windsor.

C. Upham Ely, New Haven, Conn., manufacturer of nickel anodes, has added a number of new melting furnaces to his foundry equipment at 573 Dixwell Ave., New Haven, Conn. This will give him the necessary facilities for the production of his goods.

The Metal Dross Economy Co., of Bristol, Conn., manufacturers of skimming tanks for saving metal from brass skimmings, have just received two orders for their tank equipment to be sent abroad. These orders were obtained through their export agents, Crossman & Sielcken, 90 Wall St., New York City.

The Electrical Appliance Mfg. Co., of Waterbury, Conn., is now making oven thermometers on an extensive scale. These thermometers are accurate and are made upon the White principle which insures that the instrument can be relied upon. The difficulty heretofore experienced with such goods is the lack of sensitiveness. The thermometers are also useful for lacquering and japanning ovens. The factory is on Buckingham St.

Attention is called to the fact that Davenport & Keeler, 214 Main St., New Britain, Conn., make a specialty of analyzing and testing all commercial products found in the metal trades. Brass, bronze, iron and steel, cyanide, plating solutions, oils, paints, lacquers, water and all kinds of foundry materials and supplies. They number among their clients some of the largest metal goods manufacturers in the East and will be pleased to quote prices and make contracts whenever desired. They have a new form of contract that will save money for a customer.

The business of the Waterbury Crucible Co., of Waterbury, Conn., is now being wound up preparatory to discontinuing business in that city. The stock and machinery have practically been all sold and the plant will be sold. A new crucible manufacturing company will be started within a short time in Detroit, Mich., by E. B. Seidel of the company. Mr. Seidel, however, states that particulars are being withheld in regard to the new plant and details will be given later. It is believed that Detroit is an excellent location for a crucible plant on account of the large number of brass manufacturing establishments in that locality, and in other nearby portions of the middle west.

Application has been made to the Court by J. S. Lightburn, president and manager of the Memphis Brass Works of Memphis, Tenn., to appoint a receiver and wind up the affairs of the company.

The Bradley Rust Proofing Co., 35 Ferris St., Brooklyn, N. Y., manufacturers of rust proof iron and steel goods, and proprietors of the Bradley rustproofing process, have sold the right to use their process in Russia to Russian interests.

The firm of Jordan & McGinnis has been started at Norfolk Downs, Mass., and are now conducting a brass foundry for the manufacture of brass, bronze and aluminum castings. Jobbing work is carried on and a specialty is made of aluminum castings for the trade.

The Waterbury Etching Company has started in Waterbury, Conn., to manufacture etched brass signs, name plates etc. Glass etching is carried on and a specialty is made of raised letter signs. The company has a special enamel for a background that is exceptionally durable and gives an excellent appearance to the plate. The factory of the company is on Jefferson St.

The Loeb Electro-Chemical Co., has been organized at 20 John St., New York City by Walter R. Loeb to manufacture and deal in electroplating, polishing and buffing supplies and equipment. The company has been incorporated under the laws of New York State and the factory is at Long Island City. Mr. Loeb has been, for the past three years, superintendent and assistant treasurer of the Zucker & Levett & Loeb Co., and had complete charge of the manufacturing departments of that company. His familiarity with the business, therefore, will enable him to supply the trade with the goods that they need. Everything in the plating and polishing line will be carried and a specialty made of low voltage electroplating dynamos.

The new plant of the Niagara Alkali Co., at Niagara Falls, N. Y., to take the place of the old Roberts Chemical Co., is nearly ready and will be occupied by January 1st. They are now manufacturing caustic potash, caustic soda and chlorine gas, utilizing the Biliter cell, the best known. From the chlorine gas, muriatic acid is manufactured and is absolutely free from sulphur and arsenic. A portion of the chlorine gas is liquefied and the best liquefying machinery known is used for this purpose. They are also arranging to engage in the manufacture of tin chloride, carbon tetrachloride, potassium chlorate and bleaching powder. Another branch will be the manufacture of acetylene chloride, zinc chloride, and other chlorides and oxychlorides. They are also prepared to arrange with any concern desiring to use the Biliter cell in the manufacture of paper, soap, oil refining, etc.

The Peterboro Lock Co., of Peterboro, Canada, manufacturers of locks and builders' hardware, are spending $40,000 in improvements to their plant. Their force has been increased this year by the addition of 40 hands.

The Attleboro Plating Co., has started a fully equipped and modern job plating plant at 602 West Lake St., Chicago, Ill. The firm comprises John A. McGann and Cornelius O'Connor.

The Standard Welding Co., has been incorporated in Buffalo, N. Y., to manufacture sheet metal goods by the oxy-acetylene welding process. The factory will be located at 952 Main St. The oxy-acetylene process used will be that of the Linde Air Products Co.

The Blesch Metal Mfg. Co., has been incorporated in Detroit, Mich., to carry on a metal business. The incorporators are Otto E. Blesch, 257 Grand Boulevard, East, Detroit, Mich., Edward E. Platt, and H. M. Edwards.

The plant of the Aluminum Castings Co., at Fairfield, Conn., has been increased by the addition of more furnaces. The manufacture of brass and bronze castings will be carried on at this plant in addition to the production of aluminum castings.

A brass foundry is to be built by the Franklin Brass & Foundry Co., of Reading, Pa. It will be located at Schuylkill Ave., and River Road. The building will be one story high and 47x72 feet. The company will move from their present location to the new foundry when completed.

The plant of the Macomber Mfg. Co., which was recently purchased by Wm. F. Lalley of Meriden, Conn., has been moved from Providence, R. I., to Meriden, Conn., and reorganized under the name of the Meriden Jewelry Mfg. Co. The manufacture of jewelry is carried on.

The Lumen Bearing Co., of Buffalo, N. Y., are sending out to the trade their new catalogue in which their various products are described. The catalogue has been compiled in an excellent manner and is illustrated with a large number of reproductions of their various products. The catalogue is filled with information of an interesting and useful nature.

The Baird Machine Company of Oakville, Conn., are now manufacturing an extensive line of wire reels for use in conection with standard and automatic machines. These reels are also made for sheet metal. The reels are made adjustable and are constructed so that varying widths of metal may be taken. The flanges are also made of varying diameters so that varying size coils may be used on them. The need for a suitable reel, both for the new metal and scrap, upon automatic machinery is such that this company gave the mater much attention with the result of bringing out the appliances which they are now placing on the market. Circulars and descriptions will be sent upon application.

The plant of the Sunray Stove Mfg. Co., of Deleware, Ohio is to be moved to Tulsa, Oklahoma. About 50 hands will be employed when the new factory is in operation.

The name of the Knott-Van Arnam Mfg. Co., of Fort Wayne, Ind., manufacturers of plumbers brass goods, has been changed to the Van Arnam Mfg. Co.

The No-Dust Drying Machine Co., 40 Clifford St., Providence, R. I., are now manufacturing an improved machine for drying out small metal goods by means of hot-air and dispensing with sawdust entirely.

The American Lacquer Co., of Bridgeport, Conn., have recently placed on the market a new lacquer for use on aluminum. This lacquer has the property of adhering tenaciously to the aluminum, and if desired, paint or varnish may be put on over it and they will not peel or flake off.

The Coin Machine & Mfg. Co., of Portland, Oregon, have purchased 30 acres of land in Trafford City, Pa., and will erect a large plant for the manufacture of slot machines. The company now has plants in Portland, Oregon and Kansas City, Mo. Work on the new plant will be started within a short time.

The Turnbull-Smith Co., of Syracuse, N. Y., and the Greene Plating Co., of Mechanicsville, N. Y., have consolidated under the name of the Consolidated Casting Co. A large brass foundry will be built at Mechanicsville and the Syracuse plant will be conducted as a branch. The general office of the company will be in Mechanicsville.

The Meriden Keyless Lock Co., has been incorporated under the laws of Connecticut, at Meriden, Conn., and will carry on the manufacture of hardware specalties, including the keyless locks, egg beaters, and curtain and shade holders. The factory is at 50 North Ave. B. Kreuzberger is the president; C. Yauch, vice-president; S. A. Minery, treasurer, and E. Marshall secretary.

The polishing wheels and blocks made by the Springfield Tire and Rubber Co., of Springfield, Ohio should be investigated by every one who does polishing. These blocks are made of a soft rubber compound containing the abrasive (emery or other material) and are more or less flexible. The wheels, therefore, conform themselves to a surface and obviate the need of setting up special wheels for the purpose. Circulars and information will be sent upon request.

H. S. Wyckoff, formerly with the Zucker & Levett & Loeb Co., has started in the plating and polishing supply business at 78 Barclay St., New York City, and will carry a full line of rouge, tripoli and lime compositions, chemicals, buff wheels, nickel anodes, dynamos and motors. He has secured the agency for the anodes manufactured by C. Upham Ely and will supply them to the trade. Mr. Wyckoff has been identified with the plating and polishing supply trade for many years and will give all orders his personal supervision.

The General Manufacturing & Machine Co., has been incorporated in Appleton, Wis. with a capital stock of $25,000 and will manufacture a new style of cooking range.

The capital stock of the Ball Bearing Shade Roller Co., of Naugatuck, Conn., has been increased to take care of their rapidly extending business.

The National Metallic Bed Co., 320 East 95th. St., New York City, manufacturers of metal beds, are seeking a site in New England for the erection of a new plant.

The contract has been awarded for the new building to be erected by the Waterbury Farrel Foundry & Machine Co., of Waterbury, Conn. This building will be 64x100 feet and one story high.

The factory of the Sangamo Electric Co., of Springfield, Ill., manufacturers of electrical instruments, is to be enlarged by the addition now building. This addition is 40x160 feet and two stories high. It will be used for offices, testing, assembling and shipping rooms.

The factory of E. & T. Fairbanks, Ltd., of Sherbrooke, Quebec, is to be increased so that the capacity will be doubled. Scales and steam valves are manufactured at this place, and the factory is a branch of the original one in St. Johnsbury, Vt.

The Durlacque Manufacturing Co., 2322 Olive St., St. Louis, Mo., are now manufacturing a full line of lacquers for the metal trades and can supply customers in the West very promptly. They state that their "Amberite" lacquer cannot be excelled in durability, lustre and price.

A new plating plant is to be installed by the Cleveland Metal Stamping Co., 321 Frankford Ave., Cleveland, Ohio. A new plant has been begun at Payne Ave., and 31st St., in that city. This will be 65x100 feet and two stories high. The capacity of the plant will then be increased about four fold.

Pfaltz & Bauer, 300 Pearl St., New York City, are now importing a special grade of Stearine for use in the manufacture of rouge and other buffing compositions. The stearine is much superior to tallow for the purpose and is in use by the leading manufacturers of rouge and other compositions. Samples and prices will be sent upon request.

The capital stock of the Imperial Co., of Grove City, Pa., manufacturers of plumbers' brass goods, is to be increased from $25,000 to $100,000. The brass foundry will be increased by the addition of a number of new molding machines and the buffing room will also be enlarged.

W. K. Wright, 686 State St., New Haven, Conn., is placing on the market an "Electro Black Plate" which is something entirely new. It is deposited upon metal surfaces in the regular manner, but gives a very black and durable finish. The formula is sold by him and instructions for use is supplied. Some of the largest metal concerns are now using it.

A new brass foundry is to be built by the Isaac Joseph Co., 525 Hunt Ave., Cincinnati, Ohio.

The Bartley Mfg. Co., has been incorporated in Tacoma, Washington, for the purpose of manufacturing stoves and ranges.

The Regent Jewlery Co., have begun the manufacture of jewelry at 5 Winslow St., Providence, R .I. Their line consists of hat and collar pins, pendants, etc.

A factory for the manufacture of automobiles is to be built in Springfield, Mass., by the Brightwood Motor Car Co. It is stated that it will be the largest in its line in the East.

A factory is to be erected by the Odell Mfg. Co., of Los Angeles, Cal., manufacturers of cutlery. The factory will be situated at Lawrence and Hunter Sts.

So much progress has been made upon the new plant of the American Valve & Meter Co., on Spring Grove Ave., Cincinnati, Ohio, that it is expected that it will be occupied by Feb. 1st. Railroad specialties are manufactured by this company.

A portion of the plant of the Irvington Smelting & Refining Works at Irvington, N. J., was destroyed by fire on Nov. 21st with a loss of $20,000. The smelting and refining of gold and silver sweeps is carried on by the company.

The Ansonia Novelty Co., of Ansonia, Conn., have commenced the manufacture of the Richard solderless bottom oil can. The can is made of cold rolled steel and the bottom is curled so that no solder or cement is necessary. It is claimed by them that even with rough usuage the can cannot leak.

The Joseph Dixon Crucible Co., of Jersey City, N. J., has just issued a new catalogue called "Graphite Products for the Railroad," and which contains much interesting and valuable information on the use of graphite for lubrication. The catalogue will be sent to those interested in the subject.

The Tobin Arms Mfg. Co., of Woodstock, Canada, manufacturers of fire arms, have purchased the business, patents, etc., of the Caldwell Bit & Tool Co., of Port Rowan, Ont., and will manufacture their line of hardware. The Tobin Arms Mfg. Co., recently moved from Norwich, Conn., to Woodstock.

The Geo. N. Hall Co., of Council Bluffs, Iowa, who recently moved from Pewaukee, Wis., to that place, are now in full running operation after their reorganization. They manufacture Hall's door closers, automatic latches, sash hangers, brackets, broom hangers and other hardware specialties. Electroplating is carried on.

The General Eleectric Co., of Schenectady, N. Y., have recently placed on the market an electric soldering iron in which the heating of the copper bit is done by the electric current. The heating is brought about by the use of "Calorite" a highly effective resistance material. The current passing through this material generates the heat for heating the bit.

A new factory is to be erected by the Electric Mfg. Co., of Pittsfield, Mass.

The Elgin Giant Watch Case Co., has been incorporated in Elgin, Ill., with a capital stock of $25,000.

A portion of the plant of the Acme Brass Works, East 75th. St., and Grand Ave., Cleveland, Ohio, was recently destroyed by fire.

The business of the Jandus Electric Co., of Cleveland, Ohio, has been purchased by the Adams-Bagnall Electric Co., of that city. The plant will be moved and consolidated.

The new plant of the Charter Oak Stove & Range Co., of St. Louis, Mo., will probably be completed by the first of the year. It will be equipped along the most modern lines.

The Hersey Mfg. Co., of South Boston, Mass., manufacturers of water meters and brass founders, are making an addition to their plant.

The Perfect Fireless and Electric Cooker Co., has been incorporated in Toledo, Ohio with a captial stock of $50,00 to manufacture electric cooking devices.

William C. Finck of Elizabeth, N. J., manufacturering jewler and silversmith, has recently discovered an alloy that can be used as a substitute for platinum and costs only about 3% as much.

The Southbridge Spectacle Co., of Southbridge, Mass., have under consideration the erection of a plant in Montreal, Canada for the manufacture of spectacles and optical goods.

A contract has been let by the Aluminum Castings Co., of Buffalo, N. Y., for the construction of a new heating plant which will be built in connection with their new foundries. The new foundry is to be built at Elmwood and Hertel Aves.

The winter meeting of the National Association of Brass Manufacturers will be held at the Hotel Astor, New York City, on Dec. 13 and 14th. This comprises the manufacturers of plumbers' brass goods in the United States and Canada.

The plant of the Baltimore Copper Smelting & Rolling Mills at Canton, near Baltimore, Md., is being enlarged so that the monthly output will be increased from 8,000 to 10,000 tons. Ingot copper, copper wire bars, and sheet copper are the products of the company.

The name of the Dowswell Mfg. Co., of Hamilton, Canada, manufacturers of laundry machinery, etc., and tinners and galvanizers, has been changed to the Cummer-Dowswell Co. The capital stock has been increased from $75,000 to $250,000 and extensions to the plant will be made.

The business of the United States Gas Furnace Co., of Providence, R. I., manufacturers of gas furnaces has been purchased by the Simplex Tool & Supply Co., of Boston, Mass. The business will be continued as heretofore although new lines of furnaces will be brought out later.

The Liberty Mfg. Co., has been incorporated in Dayton, Ohio, with a capital stock of $5,000 to manufacture cutlery.

An addition to the plant of Terrell's Equipment Co., Grand Rapid, Mich., is to be made. Sheet metal lockers and factory equipment is manufactured.

The King Sewing Machine Co., recently organized in Buffalo, N. Y., and which is building a plant there, are to equip a brass foundry and an electroplating plant. They are now in the market for equipment.

The Electric Cleaner Co., of Chicago, Ill., has changed its name to the Wilson-Des-Moines Electric Cleaner Co., and will move to Des Moines, Iowa. The manufacture of vacuum electric cleaners will be carried on as soon as factory buildings can be erected.

The Metal Products Co., of Providence, R. I., have begun the erection of their new building. This will be situated upon Eddy St., and will contain 19,000 sq. feet of floor space. A portion of the new building will be occupied by the Screw Machine Products Corporation.

Personal.

B. W. Preece has taken charge of the brass foundry of the Athol Pump Co., at Athol, Mass.

Paul Koning has resigned as president of the New York Metal Exchange, and his place will be filled until the next election by vice-president James E. Pope.

Chas. M. Jarvis has been elected president of the American Hardware Corporation, New Britain, Conn., to succeed the late Philip Corbin. Mr. Jarvis was largely instrumental in organizing the corporation in 1902. He was previously vice-president of the company.

Herbert G. Torrey, for 37 years chief assayer at the United States Assay office in Wall St., New York City, and Charles Taylor, who for 20 years was in charge of the laboratory of the same institution, have formed the firm of H. G. Torrey & Co., for the making of assays and analyses for the trade. Their office and laboratory is at 99 John St., New York City.

Obituary.

Charles E. Pease, president of the Buckeye Iron & Brass Works, Dayton, Ohio died on Nov. 5th. aged 74. Mr. Pease was identified with the company since its organization in 1876.

Lyman C. Smith, the well known typewriter inventor died on Nov. 5th. at his home in Syracuse. Mr. Smith was born in Torrington, Conn., and was the inventor of the Smith Premier Typewriter.

Current Metal and Supply Prices.

These Prices are net and are for moderate quantities. Smaller quantities command higher prices. Prices subject to fluctuation.

Acetone, pure, 98-99%	lb.	.22
Acid, Acetic, pure, 30%	lb.	.07
Acid, Arsenious (White Arsenic)	lb.	.20
Acid, Benzoic	lb.	.55
Acid, Boracic (Boric), pure	lb.	.12
Acid, Hydrochloric, see Acid, Muriatic.		
Acid, Hydrofluoric, 30%	lb.	.04
Acid, Hydrofluoric, 50%	lb.	.10
Acid, Muriatic, 20°	lb.	.02
Acid, Muriatic, c. p., 20°	lb.	.07
Acid, Nitric, 38°	lb.	.05⅝
Acid, Nitric, 40°	lb.	.05⅞
Acid, Nitric, 42°	lb.	.06¼
Acid, Nitric, c. p.	lb.	.08
Acid, Sulphuric, 66°	lb.	.01¾
Acid, Sulphuric, c. p.	lb.	.06
Alcohol, Wood	gal.	.50
Alcohol, Denatured	gal.	.55
Alum	lb.	.04
Ammonium Sulphate	lb.	.07
Aluminum, Metallic, in Ingots	lb.	.22
Aqua-Fortis, see Acid, Nitric.		
Ammonia Water (Aqua-Ammonia), 20°	lb.	.04¾
Ammonia Water (Aqua-Ammonia), 26°	lb.	.06¼
Ammonia Water, c. p.	lb.	.08
Ammonium Carbonate, lump	lb.	.15
Ammonium Chloride (Sal-Ammoniac)	lb.	.12
Ammonium Hydrosulphuret	lb.	.30
Ammonium Sulphate	lb.	.07
Ammonium Suphocyanate	lb.	.50
Amyl Acetate	gal.	1.85
Antimony	lb.	.07¾
Arsenic, Metallic	lb.	.15
Arsenic, White (Acid Arsenious)	lb.	.20
Argols, White (Cream of Tartar)	lb.	.31
Asphaltum, Commercial	lb.	.05
Asphaltum, Egyptian (Bitumen)	lb.	.30
Benzine	gal.	.15
Benzol, Pure	gal.	.75
Bismuth, Metallic	lb.	1.95
Bitumen, see Asphaltum.		
Blue-Vitriol, see Copper Sulphate.		
Borax, Crystals or Powdered	lb.	.10
Borax Glass	lb.	.35
Cadmium, Metallic	lb.	.70
Carbon Bisulphide	lb.	.10
Calcium Carbonate (Precipitated Chalk)	lb	.10
Chrome-Green	lb.	.50
Copper, Lake, (carload)	lb.	.13
Copper, Lake, (cask)	lb.	.13¼
Copper, Electrolytic, (carload)	lb.	.12⅞
Copper, Electrolytic, (cask)	lb.	.13⅛
Copper, Casting, (carload)	lb.	.12¾
Copper, Casting, (cask)	lb.	.13
Copper Acetate (Verdigris)	lb.	.35
Copper Carbonate, dry	lb.	.25
Copper Sulphate (Blue-Stone)	lb.	.09
Copperas, see Iron Sulphate.		
Corrosive Sublimate, see Mercury Bichloride.		
Cream-Tartar, see Potassium Bitartarate.		
Cryolite	lb.	.12
Cyanide, see Potassium Cyanide.		
Dextrin	lb.	.15
Emery Flour	lb.	.04
Emery, F F & F F F	lb.	.03
Flint, powdered	lb.	.01
Fluor-Spar	lb.	.01¼
Fusel-Oil	gal.	1.75
Gold Chloride	dwt.	.60
Gum Copal	lb.	.30
Gum Guiacum	lb.	.26
Gum Mastic	lb.	.70
Gum Sandarac	lb.	.35
Gum Shellac, brown	lb.	.50
Gum Shellac, white	lb.	.60
Iron Perchloride	lb.	.25
Iron Sulphate (Copperas)	lb.	.05
Lead Acetate (Sugar of Lead)	lb.	.15
Lead, Pig	lb.	.04½
Lead, Red	lb.	.12
Lead, Yellow Oxide (Litharge)	lb.	.12
Liver of Sulphur, see Potassium Sulphide.		
Manganese, Ferro, 80%	lb.	.10
Manganese, Metallic, pure	lb.	.75
Magnesium, Metallic	lb.	1.50
Mercury Bichloride (Corrosive Sublimate)	lb.	.93
Mercury, Metallic (Quicksilver)	lb.	.46
Mercury Nitrate	lb.	1.50
Mercury Oxide, yellow	lb.	1.80
Nickel and Ammonium Sulphate (Double Salts)	lb.	.16
Nickel Carbonate, dry	lb.	.60
Nickel Chloride	lb.	.50
Nickel Metallic	lb.	.47
Nickel Sulphate (Single Salts)	lb.	.25
Nitre (Saltpetre), see Potassium Nitrate.		
Oil of Vitriol, see Acid, Sulphuric.		
Paraffine	lb.	.15
Phosphorus, yellow	lb.	.40
Phosphorus, red	lb.	1.10
Pitch	lb.	.05
Plaster of Paris, Dental	bbl.	4.00
Platinum Chloride	oz.	20.00
Platinum Metallic	oz.	39.50
Potash-by-Alcohol, in sticks	lb.	.50
Potash, Caustic (Potassium Hydrate)	lb.	.08
Potassium Bichromate	lb.	.14
Potassium Bitartarate (Cream of Tartar)	lb.	.31
Potassium Carbonate (Pearlash)	lb.	.10
Potassium Chlorate	lb.	.15
Potassium Cyanide	lb.	.25
Potassium Iodide	lb.	2.25
Potassium Nitrate (Nitre or Saltpetre)	lb.	.10
Potassium Permanganate	lb.	.17
Potassium, Red Prussiate	lb.	.60
Potassium, Yellow Prussiate	lb.	.24
Potassium Sulphide (Liver of Sulphur)	lb.	.15
Potassium Sulphuret, see Potassium Sulphide.		
Potassium Sulphocyanate	lb.	.70
Pumice, Ground	lb.	.05
Quartz, Powdered	lb.	.01
Rosin, Yellow	lb.	.04
Sal-Ammoniac, see Ammonium Chloride.		
Sal-Soda, see Sodium Carbonate.		
Silver Chloride, dry	oz.	.75
Silver Cyanide	oz.	1.00
Silver, Fine	oz.	.55
Silver Nitrate, crystals	oz.	.50
Soda-Ash	lb.	.05
Sodium Biborate, see Borax.		
Sodium Bisulphite	lb.	.15
Sodium Carbonate (Sal-Soda), crystals	lb.	.02
Sodium Hydrate (Caustic Soda)	lb.	.05
Sodium Hydrate (Caustic Soda) by Alcohol (in sticks)	lb.	.45
Sodium Hyposulphite ("Hypo")	lb.	.04
Sodium Metallic	lb.	.90
Sodium Nitrate	lb.	.05
Sodium Phosphate	lb.	.09
Sodium Silicate (Water-Glass)	lb.	.04
Soot, Calcined	lb.	.15
Spelter, see Zinc.		
Sugar of Lead, see Lead Acetate.		
Sulphur (Brimstone) in lump	lb.	.05
Tin Chloride	lb.	.43
Tin, Metallic	lb.	.38
Turpentine, Venice	lb.	.35
Verdigris, see Copper Acetate.		
Water, Distilled	gal.	.15
Water-Glass, see Sodium Silicate.		
Wax, Beeswax, yellow	lb.	.45
Wax. Carnauba	lb.	.70
Whiting (Ground Chalk)	lb.	.02
Zinc Carbonate, dry	lb.	.19
Zinc Chloride	lb.	.12
Zinc, Sulphate	lb.	.06
Zinc, (spelter)	lb.	.06

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